An Examination of the Capture Theory of Regulation: the Development of a General Empirical Model and its Application in Two Case Settings

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AN EXAMINATION OF
THE CAPTURE THEORY OF REGULATION:
THE DEVELOPMENT OF A GENERAL EMPIRICAL MODEL
AND ITS APPLICATION IN TWO CASE SETTINGS

Ph.D. Dissertation
Gilbert Becker
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Abstract

This dissertation provides an empirical analysis of the theory of regulatory capture. Distinction is made between simpler perceptions of the occurrence of regulation, and the theory of regulation presented by Sam Peltzman. The basic Peltzman thesis is that regulation is determined by a rational political support maximizing legislator. The focus of this study is on investigating the accuracy of Peltzman's theory. To date, there does not exist a good empirical model of regulatory capture which can be used to test this theory in a broad array of case settings. A principal feature of this dissertation is the development of such a general model.

This model is then applied to two case settings. The applications serve two purposes: 1) to reexamine the evidence from two earlier studies which supported the simpler view of regulatory capture, and 2) to test the performance of the Peltzman theory, both in an absolute sense, and relative to the simpler theories.

The analysis generally supports the position that the Peltzman theory more accurately predicts the presence or absence of regulation over a profession than the simpler theory. Several variables tested, in particular those suggesting conditions under which the rational legislator will support the public's interest as opposed to that of the profession, are found to be significant.
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A.) Introduction

The "capture theory" of regulation is one of several theories which attempt to explain the existence and format of regulation presently affecting numerous occupations/industries. In the broadest of terms, it proposes that the regulations over occupational groups (or firms within various industries) are designed in such a way that the benefits of regulation go to the group being regulated. Several studies (to be examined below) have looked at the impact of regulation on important market variables such as price, income, and profits, but at present the evidence concerning the capture theory is unclear.

In part this is because of the lack of clarity in the definition of "regulatory capture." The meaning of this term has taken on various subtle changes over the last two decades. As a result, one modest goal of the present work is to clarify the meaning of the term "capture." This will be done, in the following sections of this chapter, by describing the evolution of the term through its various stages of sophistication.

Studies involving what has by convention been called the "capture hypothesis" will be the first to be reexamined. The weaknesses of this naive model of regulation will then be highlighted. This will be followed by an examination of the "predatory capture theory" and a discussion of its limitations. Finally, the most recent development in the "capture theory," work done by Sam Peltzman, will be explored. The Peltzman work,
it will be argued, develops the richest theoretical model of regulation to date. Yet, there is limited empirical evidence in support of or in refutation of his work.

The remaining purpose of this study is to produce an empirical model to test Peltzman's theory. This study provides such a model by identifying an operational set of variables which can be applied generally to a number of case studies. In addition, the model is sufficiently general so as to allow for a testing and comparison of the simpler models of regulatory capture. Finally, the model is used to expand upon previous research, which focused upon post-capture effects, by examining the factors which explain why capture occurs.

B.) Early Literature - the "Capture Hypothesis"

"Empowered by the state legislature and aligned with the profession they oversee, dental licensing boards inhibit competition through restrictive licensing practices."^1

The development of the capture theory can be divided into three stages. The early capture literature was concerned largely with the effects of regulation over occupational and professional groups. This first stage, that of the "capture hypothesis," generates some theory and considerable evidence of situations where regulation favorably affects the regulated. In the studies in this stage it was assumed that capture by the regulated group had occurred. In general we can model this hypothesis as:
\[ W = F (C, S_i) \] where

\[ W = \text{wealth or welfare of the capturing profession or industry} \]

\[ C = \text{a dummy variable (typically), having a value of 1 if regulation favorable to the profession is in place and 0 otherwise.} \]

\[ S_i = \text{a vector of other independent variables which affect the group's wealth.} \]

A number of studies were undertaken examining a variety of regulations, but two types of regulations most often considered were advertising and entry restrictions. With respect to advertising restrictions, conventional microeconomic theory predicts that restrictions on the amount and type of advertising done by professionals, and therefore the amount of information provided to consumers, will influence search costs. Where information is restricted, consumers face higher search costs and therefore tend to search less, resulting in the ability of producers to charge higher prices.

**Benham's Studies**

Over the past decade Lee Benham has produced two studies on the effect of advertising restrictions on the price of prescription eyeglasses. Both studies generate evidence that the expected effect of regulation of this type does indeed occur. The two studies are similar in format. Both attempt to measure the price, \( P \), which consumers paid for their eyeglasses as a function of a number of variables. Both estimated equations of the form

\[ P_i = a + b_1 X_{i1} + \sum_{j=2}^{N} \beta_j X_{ij} + \mu_i \]

where \( i = 1 \ldots 50 \) is indexed over the
states examined, and \( J = 1 \ldots N \) is the number of independent variables tested.

In the first study the key feature was the variable \( X_1 \), which was a dummy variable registering whether or not eyeglasses were purchased in a state where there was a total ban on advertising. Benham’s empirical work found the value of the coefficient \( b_1 \) to be positive and significant at the .01 level. Hence the result of this study was to demonstrate that in states where advertising was banned, the restriction on consumer information had in fact led to differentially higher (by $7.48) prices for eyeglasses than in states where advertising was not restricted. From this evidence Benham concluded that optometrists in some states had captured regulation.

The second Benham study differed from the first in two ways. First the new study included a second equation in the model. Along with the equation for the price of eyeglasses a demand equation was also estimated, which was of the form:

\[
Q_i = \alpha + \beta_1 P_i + \sum_{k=2}^{m} \beta_k X_{ki} + \nu_i,
\]

where \( Q_i \) = the likelihood that glasses were purchased.

The more important difference, though, was that in the original price equation the \( X_1 \) dummy variable was replaced with three alternative measures of professional control. The most successful measure, called \( AOAMEM \), is a measure of the proportion of optometrists in each state who are also members of the state optometric association. Benham describes, at some length, several sets of entrance requirements for optometrists to be eligible for membership in the state optometric association.
The evidence is quite clear that membership requires the optometrist to severely restrict his advertising.

Benham's findings in the second study show that as AOAMEM rises, across states, prices also rise. This result is not at all surprising. Given that the association members are required to restrict their advertising practices one would expect to find (as Benham did in his first study) that the more suppliers in a state who restrict advertising, relative to those who do not, the higher will be the average price paid for eyeglasses.

The AOAMEM variable, measuring the proportion of optometrists who are members of the state optometric association, is a measure of the proportion of optometrists who restrict their own advertising activities. It does not generate a measure of the optometrists' control over all suppliers or of the ability of optometrists to capture regulation as Benham suggests. Instead, the variable describes professional control in a much more limited sense of the term—professional control over the members of the profession. Benham's work then, can best be described as a demonstration of how one group of suppliers, by restricting their own members actions, has affected the price of prescription eyeglasses.

Shepard's Study

A second type of regulation which has been examined for its effect on markets is the regulation of entry. Here microeconomic principles predict that any regulation which limits the number of actual or potential suppliers in a market will cause a
higher equilibrium price and lower equilibrium quantity to be
generated in that market. Hence licensing examinations,
registration fees, government certification, and the like act
as entry barriers which benefit present suppliers and are there­
fore typically desired by professional groups.

Lawrence Shepard's case study on dental boards' licensing
practices is one of a number of studies examining entry regula­
tion. In Shepard's study, the regulation of concern pertains
to licensing reciprocity. In dentistry, as in many other pro­
fessions, a state license is required before practice is allowed.
As of 1970, several of the fifty U.S. states had statutes
which allowed dentists who were licensed in another state
to move freely into their own state and practice their pro­
fession, without having to fulfill any additional requirements.
The majority of states though had no such reciprocity statutes.
Instead, in these states an out-of-state professional, although
duly licensed in his home state (and often having proven his
competence by passing a national dental board exam as well) was
excluded from practice within the new state until further re­
quirements were fulfilled. These requirements included a
minimum number of years of experience (usually five), a
differentially higher registration fee, endorsement by the
new state's dental board, and, most important, completion with
a passing grade of the new state's dentistry exam.

Shepard and others have argued convincingly that the
individual state's examinations do not correctly test
an individual's competence. These tests often focus on technique and substance which is theoretical, and rarely if ever actually practiced. Shepard's claim is that because of this additional test requirement and because of the nature of the exam, out-of-state professionals are unduly restricted from entry into the new state. He supports this claim with evidence showing the dramatic differential in failure rates between in-state and out-of-state test takers. The evidence shows that among new dental school graduates the failure rate for out-of-state applicants was more than nine times that of in-state applicants.  

As a result, there is clear evidence of an institutional factor affecting the supply side of this market. The supply of dentists in any state is partly a function of the reciprocity policy of that state. In states where legislation forbids reciprocity, dentists practicing their profession are protected from the threat of competition from out-of-state licensees. This decrease in potential competition is expected to result in higher equilibrium prices and incomes for dentists in these non-reciprocity states.

The evidence which Shepard presents supports these hypotheses. First, using A.D.A. national dental fee survey figures for the prices of 12 common dental services, dental service price indices were constructed for each state. Using a Z-statistic to test the significance of the difference in the mean value of the indices in reciprocity vs. non-reciprocity
states, Shepard found the non-reciprocity states' index to be 6.5% higher—a value which is statistically significant at the .01 level. Using a similar difference of the means test Shepard also found that dentists' net incomes for non-reciprocity states were significantly higher than reciprocity states. 

Shepard then developed a multiple equation model designed to determine the impact of regulation on the market. Using a two-stage least-squares approach Shepard simultaneously solved a system of equations, the two most important of which took the form

\[ P_i = \alpha + \beta_1 R_i + \sum_{j=2}^{n} \beta_j X_{ji} + u_i \]

\[ YD_i = \alpha + b_1 R_i + \sum_{k=2}^{m} b_k X_{ki} + e_i \]

where \( P = \) the dental services price index, \( YD = \) the mean dental net income, \( R = \) a reciprocity dummy variable (\( R = 1 \) if reciprocity was not allowed) and \( X_k, X_j \) are two vectors of additional independent variables. Here again Shepard found \( \beta_1 \) in the price equation and \( b_1 \) in the income equation to be positive and significant, demonstrating that the regulation restricting reciprocity led to higher prices and incomes.

From this evidence Shepard came to similar conclusions as those of Benham: first, that the regulation did in fact have an impact on the market, and second that capture by dentists had occurred in some states and that in those states the benefits of regulation were flowing to the professionals being regulated.
Other Capture Hypothesis Studies

A recent (1982) article by Chris Paul concerning the capture hypothesis examines the effect of regulatory capture on the incomes of the members of the medical profession. His concern is whether or not the process of selecting the licensing board members affects physicians incomes. Specifically, he tests whether average physician incomes in states where the licensing board members are chosen by the A.M.A. are higher than physician incomes in states where the board is appointed by the governor. The reduced form equation which Paul tested can be described as follows:

\[ Y_J = \alpha + \beta_1 X_{1J} + \sum_{i=2}^{5} \beta_i X_{iJ} + \eta_J \quad J = 1, \ldots, 50 \]

where \( Y_J \) is the average physician income in state \( J \) and \( X_{iJ} \) is a vector of independent variables typically expected to affect \( Y_J \). The critical variable for Paul, \( X_{1J} \), is again a dummy variable taking on a value of 1 if the licensing board is selected by the A.M.A. and 0 if the governor appoints the board members. The expectation is that \( \beta_1 > 0 \) when the regulatory board is captured by the professionals the resulting regulations will be more favorable to physicians and lead to higher incomes for this group. The empirical tests done by Paul found support for this hypothesis as a significant (.05 level) \( \beta_1 = 2856 \) was found (suggesting that capture resulted in a $2856 income differential).

Numerous other studies on the impact of regulation
have been undertaken over the past two decades. A 1976 article by John Cady dealt with the effects of advertising regulations on drug prices.\textsuperscript{12} His model explaining drug prices, \( P_i \), was similar to that of Benham's first case study and can be described in the same fashion as

\[
P_i = \alpha + \beta_1 X_{1i} + \sum_{j=2}^{N} \beta_j X_{ji} + \mu_i,
\]

where \( X_{1i} \), again a dummy variable, has a value of 1 if drug price advertising is prohibited. As was the case in the Benham study, Cady found \( \beta_1 \) to be positive (\( \beta_1 = .029 \)) and significant (.01 level) demonstrating that price advertising regulations over retail drug suppliers caused (2.9\%) higher prices for drugs in those states than in states where such advertising restrictions were not in effect.\textsuperscript{13}

In a comparative study of three professional groups, Arlene Holen demonstrated that variations in professional licensing arrangements affected the mobility and incomes of lawyers, dentists, and physicians.\textsuperscript{14} Holen compared the interstate mobility rate of the first two professions, where most licensing boards require state specific exams to be passed, with that of physicians, where "there is an elaborate and effective system of reciprocity." She found lower mobility rates for the first two groups where entry restrictions were more severe. In addition she found evidence, reported in a number of tables, showing a tendency of failure rates on licensing exams to be positively correlated with average income.\textsuperscript{15}
In his 1965 study, Charles Plott examined the market effects of price fixing regulations set by the Oklahoma drycleaning licensing board. Plott compared Oklahoma with Kansas, where no such price fixing regulations existed and found evidence, demonstrated in a large number of tables, that the growth in the number of establishments, total revenues, and the total employment of labor and other resources was higher in Oklahoma, where it was assumed that a licensing board (made up of 3 members of the profession) would fix minimum prices above the competitive prices found in Kansas.

Other studies of the effects of regulation on markets include numerous F.T.C. reports, one example being a 1974 report on the television repair service industry. The report studied the impact of various different methods of controlling the quality of service (by controlling fraud) in the industry. One of the study's conclusions was that prices for service repairs in areas where a licensing exam is given to all who desire entry into the industry are higher than prices in unregulated areas. The report demonstrated, using a difference of means analysis similar to that used by Shepard, that New Orleans' prices for T.V. repair (where licensing is required) were significantly higher than in San Francisco and Washington, D.C., where no license is needed. The report further concluded that the preferred method of controlling consumer fraud is by instituting an investigative board (as is done in San Francisco) which is not dominated by industry members.
A central theme of the articles cited above, and explicitly stated by Benham and Shepard, is that of regulatory capture. The studies demonstrated that not only did regulation affect the equilibrium in the market but that the effect favored the group being regulated. The authors were concerned with the fact that the regulation of these service-oriented professionals was often being controlled by the professionals themselves. As a result, it was suggested that the regulations were not being designed (as suppliers insist) with the protection of the public in mind, but instead were designed and implemented to advance the economic well-being of the members of the profession.

It is essential to note that the scope of these articles, and the empirical work therein, is limited to the resolution of the question of whether (and how) regulation affects the market. For example, the question which Benham explores in his studies is simply: do restrictions on advertising lead to higher prices? His response, quite clearly, is yes. A quite different question which evolves as a natural extension of Benham's work concerns regulatory capture. If, as Benham has demonstrated, variations in regulations do affect prices, then it is of value to explain the causes of the variations in these regulations. Benham implies that regulatory capture has occurred wherever advertising restrictions are in place. There is a distinct difference, though, between demonstrating the impact of advertising regulation on prices, as Benham has done, and demonstrating the ability of a group to capture regulation, or in other words, identifying
the causes of the variations (here, across states) in the existing regulation.

Shepard's study invites a parallel reaction on the part of the reader. Although the differential between the equilibrium prices and incomes of dentists in states allowing, and those forbidding, reciprocity has been established theoretically and empirically, no explanation has been offered in response to the logical follow-up question of why the variations in dental regulations exist. Similar follow-up questions remain unresolved in the studies by Paul, Cady, and each of the others mentioned above.

As Richard Posner suggests, an answer to these questions was not readily available because there did not exist a "capture theory" but simply a hypothesis of regulatory capture. Political scientists and others had developed a perception of industry groups being able to "capture" regulation. Economists such as Benham and Shepard had shown the impact on the markets (and especially the suppliers in those markets) where regulation was in place. But to this point no theory had been developed to explain when capture would occur, or why in some cases it had not occurred, or what would be the outcome of a situation where a number of occupations/industries with competing interests attempted to capture regulation. A theory of regulatory capture would have to go beyond the simple assertion that regulation is capturable and will be captured. It must be able to provide an explanation as to where and why a
group will (or will not) be successful in the regulatory arena. It is these questions then which bring us to the second stage in the development of the capture theory—the "predatory capture" theory.

C.) The Predatory Capture Theory

In a 1971 article George Stigler offers the first attempt to develop a theory of regulatory capture. In his work Stigler makes use of basic economic principles to generate a description of a process by which capture (as found in the studies which both preceded and followed his work) occurs.

The first postulate which Stigler brings forth is simply that the motivation of any interest group is income or profit maximization. Stigler's work brings to the forefront the idea that not only does regulation result in a reallocation of resources, but also it affects income and wealth distributions. The state, unlike the marketplace, has the unique power to tax and transfer income among groups in our society. To the extent that regulation alters the equilibrium price and quantity achieved in the unregulated market, various types of regulations essentially result in different wealth transfers. The demand for regulation by any group is thus seen as being the demand for a favorable wealth transfer to that group.

Stigler argues that the intensity of the demand for various types of regulation should play an important role in modeling the existence of regulation. This demand intensity may vary
either across professions or across states within one profession
and if so, the question of why variations in regulations exist
can be answered in part by looking at the variations in the
strength of the demand for regulation.

At the outset of his work Stigler states,

"A central thesis of the paper is that as a rule regulation is acquired by the industry
and is designed and operated primarily for its benefit."22

He then goes on to explore, in an empirical portion of the paper
(to be discussed below) "the characteristics of an occupation
which give it political power".23 Given these essential elements of Stigler's work, we may define Stigler's interpretation of capture as follows: There exists a well defined professional/industry group, the demander of regulation, which actively seeks regulation, and that group's success is dependent largely upon certain characteristics (to be defined below) of the group and the environment in which it exists.

In a recent article on the capture of railroad regulations, Richard Zerbe uses the term "predatory capture" to describe Stigler's work.24 This term is appropriate given Stigler's perception of an industry "acquiring" regulation and given that the acquisition to which he refers is clearly an aggressive behavior on the part of the group. Consequently, the term "predatory capture" will henceforth be adopted when referring to Stigler's interpretation of regulatory capture.
The Predatory Approach: Some Examples

As mentioned, economic theory provides an important tool for determining the strength of the demand for regulation. Examples of this are easily achieved and a few will now be presented as illustrations. One factor determining the intensity of demand for regulation would be the expected gain which the group would receive from that regulation. Producers' demands for advertising restrictions, for example, may vary across industries for the simple reason that in some industries advertising restrictions may lead to substantially higher search costs and hence large price increases, while in other industries the effect of advertising restrictions on prices may be much smaller.

Of equal importance in establishing the intensity of any group's demand for regulation is a determination of the costs to the group of obtaining regulation. Here, as Posner has demonstrated, the theory of cartels may help locate some of these costs since, in some respects, the costs of establishing either a cartel or regulation are similar. Cartel theory indicates that one important cost facing the cartel members is that of organizing and agreeing upon an optimal strategy. Firms willing to join a cartel must meet and make decisions concerning prices, the division of market shares, etc. Even if the members accept that a cartel is in the best interests of all firms, though, it is sometimes true that the cartel never evolves beyond the initial organization stages. Variations in
firm sizes, pre-cartel profits, management objectives, and
the like may result in an inability of all members to agree on
a strategy.

The same types of costs face any group which chooses to use
regulation rather than cartelization to improve its position.
This group must also organize and develop goals and strategies
with which each member is willing to conform. Here, one key
strategy concerns how to best use the "legislative marketplace."
The individual members of the group must first agree upon a most
desirable form of regulation to seek, and then must work to­
gether to achieve their common goal.

Given that a most desirable form of regulation can be
agreed upon, the group must still enter the political arena to
announce and work for the acceptance of its demand. Once
again there will be costs to face. As Stigler and others have
pointed out, the legislative marketplace maintains one very
important difference from the normal market in that once a
decision concerning an industry is made, it must be adhered
to by all who are suppliers in that industry. As a result,
the problem of the free rider may arise. Since all existing
suppliers will gain from any pro-industry regulation imposed
on the market, there arises the incentive on the part of the
individual suppliers to forgo participation in the costly
information and organizational activities of the group, while
still receiving all of the benefits of the group's actions
when (and if) their regulatory demands are met.
The above are but a few examples of how economic principles can be used (as Stigler suggests) to measure the intensity of the demand of the "capturing group." It is this format which he then uses to test the ability of a number of occupational groups to "capture" regulation.

**An Empirical Test of Predatory Capture**

Having argued that regulation is but a good demanded by an interest group and that regulation's existence can be explained by the intensity of the demand by that group, Stigler developed a simple empirical model designed to test his theory. The hypothesis tested was that the "predatory capture" theory of regulation could be used to explain variations, across states, in the year in which regulation over entry first took place in a number of different occupations. For each of eleven occupations, tested separately, his test model was:

\[ \text{YEAR of 1st REG} = \alpha + \beta_1 \text{ OCC SIZE} + \beta_2 \% \text{ URBAN} + e \]

Although Stigler did not specifically present it as such, the model can be interpreted as being equivalent to a reduced form supply and demand equilibrium. The YEAR OF 1st REGULATION over an occupation depicts the equilibrium year in which entry regulations were supplied, while the right hand side variables measure demand intensity on the part of the occupations being studied. From the predatory capture interpretation, legislative supply is largely passive; regulation is demand determined.

Although additional measures of demand conditions were
suggested only two were seen by Stigler as operational. The first, OCC SIZE, was used as a measure of the voting strength of the occupation. It was expected that the larger the value of this variable, the earlier the year in which pro-industry regulation first took place. According to Stigler, a large value for this variable indicates a strong demand (number of votes in an election) by the occupation.

The second variable tested, % URBAN, measures the urbanization of the members of the occupation. Stigler expected that as the percentage of occupation members living in urban areas (and therefore relatively close to one another) grew, the costs of organizing for political action would fall. In highly rural states, where large percentages of members are physically dispersed, the organization and information costs would be high. In states with a large percentage of occupation members living instead in a few urban areas, these costs would be reduced and the pro-occupation regulation demands would be acquired at an earlier date.

The results of his tests generated at best limited empirical support for the "predatory capture" model. Statistical significance was found in one of the two independent variables in eight of the 11 equations (for 11 occupations) tested. In only one case were both variables significant. Stigler cites data problems as a primary cause of the insignificant and often inappropriately signed regression coefficients. 26

More importantly, the estimation technique used by Stigler
is inappropriate. The Stigler work appears in fact to be testing the following: for a given occupation, for those states which have instituted entry regulation, do the two independent variables given explain the year in which regulation first took place? This approach leaves out the valuable information that some states had not instituted regulation—a fact which demonstrates that predatory capture is not universal.

The Public Interest Hypothesis

By his own admission Stigler's work largely accepts the proposition that it is the industry which acquires the benefits of regulation passed by a legislature. By conventional wisdom, though, there are two broad approaches by which the existence of regulation has been explained: 1) some form of regulatory capture and 2) the "public interest" hypothesis.

What is commonly known as the public interest hypothesis was perhaps the first attempt to explain the evolution of regulation. As its name suggests this hypothesis proposes that regulation is established to meet the needs of the (non-producing) public. Here the public's interest may be loosely defined as being accounted for if regulation leads to one of the following: 1) correction of a market inequity such as excess profits resulting from a natural monopoly or 2) correction of a socially undesirable market outcome, for example, a pollution externality or poor quality of service. The public interest hypothesis, then, identifies the existence of regulation with the prior existence
of some public "bad" and the public's desire to correct the problem.

Stigler is aware of the competing hypothesis and its relevance in some settings. His work, though, suggests that in most cases where a link can be drawn between the public interest and an existing regulation, the presence of the regulation is in fact explained by the existence of a demand by some industry group which also desires the same regulation. Furthermore, in dealing with the process of acquiring regulation, only the industry is focused upon. In his empirical work on occupational licensing he thus rejects the concept of the public being a serious political force and instead tests solely the strengths and abilities of the occupational group. In the studies cited above, though, the conclusions were drawn from a comparison of states (or cities) where a regulation benefited either the public or the industry (but not both), and the evidence shows that in numerous cases the industry did not prevail. Still remaining, then, is the question of why the variation exists, if regulation can be explained by a predatory capture model.

In those cases where a regulation can be interpreted as a zero-sum game (for example, where entry restrictions raise prices and producers gain what consumers lose) it is not possible to fully explain the pattern of existing regulation with the "public interest" hypothesis alone or the "predatory capture" hypothesis alone. What is needed is a theory of regulation
which is sufficiently general so as to allow for either, or both. The theoretical work by Sam Peltzman, stage III of the capture theory, provides such an approach, where the two competing hypotheses can coexist.29

D.) The Peltzman Model

The first unique contribution of Peltzman's work lies in the fact that regulation is looked at from the point of view of the regulator. Along with the work by Stigler and others on the behavior of the interest group, Peltzman has incorporated the fundamental elements of a theory of the behavior and incentives of the regulator/legislator "being captured." Peltzman's work begins with the simple yet vital realization that a legislator's primary objective is to maximize the political support—both in terms of votes and campaign contributions—which he receives at election time. Given this assumption, the legislator can be modeled as an economic agent who must decide upon a strategy whereby the form of regulation he chooses, and hence the amount and direction of the wealth transfer he chooses, maximizes the likelihood of his reelection.

Formally, Peltzman's model has each legislator maximizing a majority M, given

\[ M = n \cdot f - (N-n) \cdot h \]

where

- \( n \) = number of potential votes in the beneficiary group
- \( f \) = net probability of support by a beneficiary


N = total number of potential votes (thereby making N-n
the number of potential votes of the losing group)
h = net probability that an individual who loses opposes.
The probability of support, f, is then given as
\[ f = f(g) \text{ where } g = \frac{T - K - C(n)}{n} \]
T = total $ amount transferred to the beneficiary group
K = total $ spent by beneficiaries (campaign funds, etc.)
C(n) = cost, to the beneficiary group, of organizing
The probability of opposition, h, is given as
\[ h = h(t, K/N-n) \]
Hence, opposition is assumed to increase with the tax rate and
decrease with the campaign dollars available from the beneficiary
group, used to educate the losing group.
Finally, the wealth transfer, T, resulting from regulation
is assumed to be generated from a tax, of rate t, on the wealth,
\( \beta \), of each member of the losing group, so that
\[ T = t \cdot \beta(N-n) \]
Given that the legislator has three decision variables n,
T, and K, there exist three necessary conditions which must be
met in order for a maximum majority to be achieved. From these
first-order conditions Peltzman generates a number of conclu-
sions. The most important result can be extracted from the
necessary condition concerning the decision variable T, which is,
\[ M_T = 0 = f - h_t \left( \frac{1}{\beta + t\beta_t} \right) \text{ or rewritten we find } \]
\[ f = h_t \left( \frac{1}{\beta + t\beta_t} \right) \]
An explanation of this condition, in Peltzman's words, is that the legislator must choose T in such a way that "the marginal political return from a transfer must equal the marginal political cost of the associated tax." In other words any time a legislator considers a change in regulation which results in a transfer of wealth from one group to another, he must realize that every $1 transferred to the beneficiary group results in a certain increase in political support which will be received from that group. At the same time, though, the $1 taxed from the losing group will result in a certain decrease in the political support which the legislator can expect to receive from this group. Hence, to choose the optimal T, the legislator will choose that value where the marginal gain to him (in terms of political support) is just offset by the marginal loss.

This result is extremely important in that it suggests that even if only one interest group receives all of the benefits associated with a change in regulation the incentives of the legislator force him to consider, at the margin, all of the different interest groups which are affected. As we have seen, the "predatory capture" theory has suggested that the industry/occupational group typically is the one to capture regulation, or in other words, the legislators are seen as taking on the interests of the industry/occupation alone. The expanded "capture" theory as described by Peltzman is more complete in that the interests of all groups are accounted for by the
legislators (albeit with different weights). If the desired regulation will effect "the public" then their demand must be taken into account. If the proposed regulation will impact another industry/occupational group, the legislator will pay heed to the political losses he will suffer by hurting that group. In a broad sense then, Peltzman's model generates a dictionary definition of capture—in other words, any group can capture regulation. Thus one is no longer forced into the undesirable position of having to choose between accepting either the "predatory capture" or the "public interest" theory, neither of which, by itself, is sufficient to fully explain the variations in present regulations, either across occupations or across states within one occupation.

Whereas the capture hypothesis studies can be modeled quite generally as \( W = F(C) \), these studies do not explain \( C \). The predatory capture theory, \( C = G(X) \) where \( X \) is a vector of variables measuring the occupation's political strength, can be seen as explaining the cases where predatory capture occurs \((C=1)\), but not, or not fully, \(^{33}\) the cases where it does not. Peltzman's work can be interpreted as addressing the question of capture more broadly. His work can be modeled quite generally as \( C = H(X,R) \) where \( R \) is a vector of independent variables measuring the demands/interests, and political strength, of opposition groups. Within this framework the cases where predatory capture by the occupation does not occur \((C=0)\) are more fully explained.
This interpretation of Peltzman's model as being of the form \( C = H(X,R) \) follows quite clearly from the objective function in Peltzman's formulation of the model. Recall that the objective of the legislator is to maximize the majority \( M \), where \( M = f \cdot n - h(N-n) \). The \( f \) and \( h \) variables measure the probability of support and opposition to the legislator. Clearly, the \( X \) and \( R \) variables are precisely those factors which are needed to measure \( f \) and \( h \). If it is in the legislator's interest to listen to the demands of groups in his constituency, then the intensity of those demands (\( X \) and \( R \)) will indicate the likelihood of the support/opposition (\( f \) and \( h \)) of these groups, and thereby explain the existence, or lack thereof, of the occupation-favoring regulation.

The theoretical model is complete. What still remains though is the identification of a set of variables (\( X \) and \( R \)) which can be applied when attempting to explain regulatory capture in a variety of occupational settings.

**Evidence Concerning Peltzman's Theory**

Since Peltzman's work a limited number of articles have been written attempting to generate empirical support for his model. In his 1978 study of the I.C.C., Thomas Moore has demonstrated that two groups have gained from I.C.C. regulation—labor, and owners of truck operating rights. Using trucking payroll data he presents a table of data showing that employee compensation is 30% higher in regulated than in unregulated firms.
He also generates evidence of high (40-70%) returns on investment on the purchase of the common carrier certificate.\textsuperscript{34}

In an earlier (1969) study, Moore similarly argues that the pattern of licensing of occupations in Chicago and in Illinois, while benefiting the regulated by restricting entry, also protects the public interest.\textsuperscript{35} He argues this point by suggesting that the occupations licensed earliest were those of greatest importance to the public and those (e.g., medicine) where the public's information is the poorest. The importance to the public (measured by total income of the occupation) and the public's lack of information (measured by the number of years of education of the professional) were both found to be statistically significant and of the appropriate sign in a multiple regression explaining the year regulation took place.\textsuperscript{36}

Both of Moore's studies are consistent with Peltzman's theory. The Peltzman model suggests that a rational legislator will spread the gain over many groups if this strategy promotes his own reelection goal, and in each of his studies Moore has demonstrated that more than one group has gained from a regulation. The limitation of Moore's studies though is that they only demonstrate that several groups who were interested benefited from regulation. They do not demonstrate that the extent to which each group gained was a function of its ability in the legislative marketplace.

A third study, by Keith Leffler, examines the licensure of physicians in the U.S.\textsuperscript{37} Leffler demonstrates, by calculating
a Z-statistic of the difference in the mean incomes of physicians in states where a national exam is accepted vs states where it is not, that physicians in the latter group had significantly (.05 level) higher incomes. He follows this up, though, with the argument that consumers in different states desire different standards. First, if quality is a normal good, higher income consumer groups will desire higher licensing standards. Second, if groups differ in the extent to which they believe in a "society knows best" philosophy, the licensing standards should also vary. Measures of both of these public interest hypothesis variables were found (again, in a multiple regression equation) to help explain variations in the licensing standards.

Leffler's general conclusion then, like Moore's, was that both groups benefit from the regulation. The evidence in Leffler's study is also consistent with Peltzman's model if the rational legislator is seen as attempting to split the benefits accruing from this regulation. Here again though, no evidence is given that it is, in fact, the political strengths of the different groups which have determined the benefit split chosen.

Perhaps the strongest support of Peltzman's model is presented in a 1980 article by Sharon Oster. Oster's work examines the causes of interstate variations in each of four different consumer regulations. In her study she generates empirical evidence, in the form of significant parameters in LOGIT equations, that the existence, or lack thereof, of each regulation in any state depends upon both the demands of
consumers and the demands of producers. Her work indicates that variations (across states) in the intensity of these demands helps to determine the existing pattern of regulation across all states.

One of her case studies attempted to explain whether a holder in due course (HIDC) law, which has the effect of forcing consumers to make payments for defective products purchased on credit, was waived in any state. The model estimated took the form

\[ Y_i = \alpha + \beta_j X_{ij} + e_i \quad i = 1,...,50, \]

where \( Y_i \) was a binary variable, having a value of 1 if the HIDC law was waived, and \( X_j \) was a vector of consumer and producer pressure variables (described below).

Although the empirical work supported many of her hypotheses (over half of the \( \beta_j \)'s were significant) and therefore Peltzman's work, two shortcomings of this work need to be mentioned. First, an analysis of the specific independent variables used will show that most of the measures are indirect indicators of consumer/producer pressure. For example, \( X_1 \) was a measure of the percent of the total credit in a state originating in the retail sector. The greater the extent to which consumers use credit in a state, Oster argues, the greater the benefits to consumers from the regulatory protection. Unfortunately, while we have a good measure of the degree of interest of the group, again the question of whether the group has enough political strength to affect the regulatory
process is not examined. A preferred measure would indicate more directly the impact which consumers (or producers) have on a legislator's decision-making, instead of assuming the link between consumer (or producer) desires and action by legislators.

The only other consumer variable is a "complaints on defective products" dummy variable, which has a value of 1 if such complaints "were among the top 20 complaints in the state," and zero otherwise. Here again the difference, across states, in potential benefits to consumers is clear, but that it was a variation in their political effectiveness which causes variations in $Y_1$ is not shown.

Similarly, the strongest industry pressure variable, $X_3$, the percent of the population below the poverty line, was used as a measure of the financial sector's demands for HIDC rules. Oster argued that since low income groups have higher default rates, financial institutions in states with high values for $X_3$ would benefit more from protection. This variable, as well, serves best as an indirect measure of regulatory capture. Finally, it should be noted that Oster does include a "presence of large banks" variable but does not explain how or why or indeed if they are more politically "powerful" than smaller banks.

A second shortcoming is that the consumer/producer pressure variables chosen are mostly case-specific. Although Oster's work is in one sense general—in each study her groups
of independent variables are: 1) Consumer pressure variables, 2) Producer pressure variables and 3) An Ease of Coordination variable—the actual measures used (e.g., percent retail credit) apply to only one case study.

The value of Oster's work should not be understated. In the case studies analyzed several of the different consumer and producer variables are significant, generating support for Peltzman's model. In the present study though, one of the goals will be to improve upon works such as Oster's by presenting a set of independent variables which are 1) more direct measures of the extent to which legislators are/must be sensitive to consumers and producers and 2) more general in the sense that the same variables can be applied to a variety of different industry/occupation regulation cases.

D.) Testing the Peltzman Theory

The present study is an examination of Peltzman's theory of regulation as it applies to two case studies—dentistry and optometry. I have chosen to focus on the regulation of these two professions for several reasons. First, the previous studies by Benham and Shepard both claim support for the regulatory capture hypothesis but neither resolves the more interesting question of why predatory capture occurs in some states but not in others. My own work is therefore a logical extension of these two previous studies.
Second, service oriented markets are typical examples where regulators face competing desires concerning regulation. Specifically, in both of the studies to be examined there exists a conflict between the desires of the professionals and the desires of the consuming public. As a result, the "predatory capture" and "public interest" hypotheses clash. 41

Finally, there exist well defined boundaries, states, across which the existence of regulation varies. This geographic breakdown of the professions into 50 markets (states) having differences in regulation provides a logical basis for cross-sectional analysis.

In chapter II the method for implementing an experiment testing for the variation in predatory capture will be examined. Again it is important to note that the emphasis in the study will be upon identifying an operational set of variables which is applicable to a number of different cases. This being accomplished, the present work, although involving two case studies, will in fact advance the theory of regulatory capture beyond this (case by case) level of analysis.

Chapter III will present the results of the empirical work. A model of the Peltzman theory of regulation will be compared with that of the predatory capture theory. The evidence will demonstrate that the Peltzman model is clearly preferred.
Footnotes for Chapter I


4 The second measure was a ranking, by commercial suppliers, of states according to perceived restrictiveness of regulations. A third measure was the market share of commercial firms in the various states. *Ibid.*

5 The price differential between the lowest and the highest AQAMEM states was calculated to be $12.48. *Ibid.* p. 435.

6 If AQAMEM is negatively related to the market shares of commercial firms, then as AQAMEM rises, the restrictions on optometrists advertising apply to a larger percentage of the total number of suppliers. Benham states that the simple correlation between the two variables is $r = -0.47$, yet even with this result, no demonstration has been made of the ability of optometrists to capture regulations over both groups.


8 Furthermore, among new dental school graduates, the out-of-state failure rate in non-reciprocity states was more than twice that of the reciprocity states. *Ibid.* p. 188-89.


13 Ibid., p. 500.


15 Ibid., p. 493-95.


19 Posner cites the I.C.C. as the classic example. The capture hypothesis at this point would be of no aid in determining which group (truckers, railroads, or barges) would capture the board. *Ibid.*, p. 342.


21 This idea had its origins in James Buchanan and Gordon Tullock's book *The Calculus of Consent* (the University of Michigan Press, Ann Arbor, Michigan, 1962) p. 72, where government is described as "a machine for collective action."

22 Stigler, p. 3.

23 Ibid., p. 13.


25 Posner, p. 344.

26 Stigler, p. 15.

27 Although numerous statutes examined during this study held clauses stating that the regulation was in the "public interest," curiously none of the statutes attempted to define the term.

28 Except, of course, in the case where one group is always the winner in every setting (e.g. in all states).

30 It is assumed that ignorance on the part of the beneficiary results in no vote or in a vote determined at random. In either event $f = 0$. Similarly, $h = 0$ if a "loser" is ignorant.

31 It is assumed that both $T$ and $K$ are chosen by the legislator. Peltzman also demonstrates that with some regulations the beneficiary/losing group can be partitioned by appropriately designing the regulation. In these cases the regulator chooses $n$ as well.

32 Ibid., p. 217.

33 For those cases where predatory capture does not occur the predatory capture theory must argue that the occupation has weak demands.


36 Ibid., p. 108.


39 Ibid., p. 47. The source and method of measurement of this variable was not disclosed.

40 The exception in Oster's studies is an "Ease of Coordination" variable--comparable to Stigler's % URBAN measure. This variable, used in each study, is also the most direct indicator used of a group's ability to apply political pressure.

41 In the studies by Moore and Leffler it is argued that the professional and public interests do not clash directly--suggesting a non-zero sum game. Several points need to be made here. First, a more accurate description of the interest groups may demonstrate that there are both winners and losers. For example, in his first study Moore doesn't consider the public, which loses in dollars what labor and the owners of operating rights gain.

Moreover, the Peltzman model does not hinge on a zero-sum. For example, if there are utility gains from regulation (to risk averse consumers now assured of higher quality) which partially offset the higher prices they must pay, the Peltzman model would simply assign different probabilities to the strength of support for the regulation.
Finally, in the present study, as both Benham and Shepard have argued, the regulations under consideration have no impact on quality. Thus, in this analysis the zero-sum game (the producers' gain in income equals the consumers' loss) applies.
CHAPTER II
A. A Method of Testing for Variations in Predatory Capture

The objective of this chapter is to design a test which will generate an explanation of the variation, across states, in the existing regulation over a professional group. The predatory capture theory offers a mechanism by which professionals capture regulation but as the studies by Benham and Shepard show, predatory capture is not universally achieved. Peltzman's theory provides the theoretical reasoning for the existing variation in predatory capture by broadening the analysis to where the regulator encounters a variety of interest groups.

The first step, then, in developing a test of Peltzman's theory is to properly identify all of the interest groups. The groups will be distinguished in terms of their desires/interests vis-a-vis a particular regulation. These interests may be deduced by identifying the potential benefits/losses to a group from the institution of a regulation.

Once the groups are identified we must return to the framework of Peltzman whereby regulation is looked at from the point of view of the regulator (as opposed to the viewpoint of the "predator"). This is necessary since establishing that any group will benefit from (and thus will present demands for) a regulation is one task, while establishing whether and why a regulator will react to these demands is quite another. Consequently, a set of variables identifying
the legislator's sensitivity to each group and the "political ability" of each group needs to be defined.

Finally, once this is achieved both the Peltzman and the predatory models can be tested. The predatory model will suggest that only the professionals' (the predators') interests and political strengths will be reacted to by legislators. Peltzman's theory is a generalization of the predatory theory in which the indicators of the strengths of all groups (including the predatory group) are included in determining the variation in regulation.

B.) The Interest Groups: Dentistry

In the study of regulation affecting dentists the regulation studied by Shepard was a statute concerning reciprocity. From Shepard's work the existence, or lack thereof, of this regulation causes a wealth transfer between two groups: the profession and the consuming public. The restrictive (non-reciprocity) statute, causing higher prices (a wealth transfer from the public to the present members of the profession) will be desired by the practicing dentists. The public would prefer the less restrictive regulatory position which yields lower equilibrium prices and therefore allows for a greater quantity of dental care to be obtained. Thus, in terms of the wealth effects of the regulation a two group model is suggested. The professional group though (as will be argued
below) may be divided in terms of their demands for the regulation due to differences in non-pecuniary effects.

The immediate consequence of having more than one interest group is of course that Peltzman's theory can be tested. Furthermore there exists one additional important feature of the case studies at hand which should be emphasized. It is often argued that the second group, the public, is typically a very weak interest group. That being the case, this study should provide a strong test of the Peltzman theory that legislators must be sensitive to the actions of all interested and affected groups. According to Peltzman, when considering a wealth transfer of a fixed amount, the rational legislator will determine the probability that making such a transfer is rational (for him) by taking into account both the variations in the probability of support by the predatory group and the variations in the probability of opposition by the "weak" group.

C.) The Interest Groups: Optometry

The Ophthalmic Goods Industry

The structure of the ophthalmic goods industry roughly can be divided into three stages of production and distribution: 1) manufacturing, 2) wholesale labs, and 3) retailing. The third sector of the industry, the retail sector, provides the typical link between consumers and manufacturers/wholesalers
which is prevalent in many industries. It is this sector and the regulation involving the members in this sector which is of interest.

Within this retail sector there exist three groups of eyeglass suppliers which need to be distinguished. The first group of eye service suppliers consists of ophthalmologists. This group is made up of licensed physicians whose specialty is the care and treatment of the eye. Their functions range from examination of the eye and diagnosis of disease and defects, to the performance of surgery, to the prescription of drugs and/or lenses. In addition, some of these physicians (approximately 40%) also dispense eyeglasses.

The second group of retailers is optometrists. These professionals are licensed in all 50 states and their functions and services include examining the eye for defects in vision, prescribing eyeglasses, and also dispensing eyeglasses. Unlike ophthalmologists though, optometrists may not prescribe drugs, diagnose eye diseases, or practice surgery. Consequently, they focus sharply on the prescribing and dispensing functions.

The third group of retailers is opticians. This group, which is largely unlicensed, provides a much narrower function in the market. Their function is even more limited than those of optometrists in that they may not examine the eye, nor write prescriptions. Consequently their predominant function is that of dispensing eyeglasses to consumers.
The Capture Variable

Of particular importance to the latter two groups is whether or not commercial firms are allowed to advertise price. Hence we will define predatory capture as having occurred in a state if commercial firms in that state are not allowed to price advertise. The justification that this restriction is important from a theoretical point of view has been generated in the literature on the economics of information. Conventional wisdom examining the question of consumer information maintains that a rational consumer will acquire less than full information about the prices for the products and services in a market since information and search is costly and at some point the marginal cost of additional search exceeds the gain in lower prices found. As a result, in a market where information has a nonzero cost, the lack of full information on the part of consumers generates two effects on prices.

First, the average price in the market without perfect information is expected to be higher than in the market where consumers are perfectly informed. This is true because producers are able to charge a price, \( P \), which is greater than the perfect information price, \( P_1 \), such that \( P - P_1 < C_1 \), where \( C_1 \) is the cost to the consumer of being fully informed. Secondly, the dispersion in prices around the mean is expected to be higher in the imperfect information environment. Moreover, the existing evidence supports the theory that price information
(in the form of advertising) lowers price dispersions and mean prices in the market. Studies by Benham, Cady, and Marvel, cited above, are examples.

In addition, a 1976 study by the F.T.C. on the ophthalmic goods industry found substantial evidence concerning price dispersions. Part of the study compared price dispersions at the manufacturing and wholesale levels with those at retail levels. The study demonstrates that at the manufacturing and wholesale level, where the number of suppliers is small and price data flows freely between retailers and manufacturers (via pricing catalogues), price dispersions are minimal, whereas at the retail level, where the number of suppliers is large and price information is less available, price dispersions were significant. Thus, the report concluded that the price dispersion at the retail level was not due to a similar dispersion at the manufacturing/wholesale level. In addition, the authors concluded that the lack of information at the retail level led to high price-cost margins and substantially higher prices than would be the case if advertising restrictions were dissolved. 5

The Interest Groups

A number of interest groups arise in this study. The optometrists, as Benham makes quite clear, are the predatory group. They have, as the following quotation demonstrates, quite sharp interests in diminishing the role of their
commercial firm competitors in the industry through the introduction of "professional behavior" (e.g. no price advertising) rules.

"Optometry has passed through periods of earnest debate on the need for professional behavior. Today there is no longer such debate... Most recently, the American Optometric Association set a target date in the 1970's for the total disappearance of commercial practice."6

Specifically, the optometrists desire to restrict advertising and, in particular, price advertising in the industry. As they are vertically integrated in the services which they provide to consumers they hold an advantage over commercial firms in that many consumers prefer the convenience of "1-stop" service. Restrictions on advertising, especially price, would limit opticians in their ability to attract consumers away from optometrists by limiting their ability to announce lower prices.

Immediately a second interest group, directly affected by the regulation, is apparent—the commercial firms. Their interest in the freedom to price advertise is quite understandable. Limited in the services they may offer, opticians are dependent upon sales, and the ability to compete in terms of price is heavily dependent upon the ability to price advertise. This group, then, will be considered (in the Peltzman model) as a competing interest group opposing the predators (optometrists).

A third group which will also be considered
(again in the Peltzman model) is the consuming public. The effect of the restriction on advertising, as Benham has shown, is to raise prices which consumers pay. Consequently the public as a group is expected to prefer allowing advertising of prices to occur.

Finally, a fourth group which is to be considered is advertising agencies. The regulation under consideration pertains to advertising restrictions and therefore one would expect that advertisers are interested in this issue and indeed they are. Recent articles appearing in Advertising Age support this claim. The articles cite evidence that the American Advertising Agency Association is actively interested in federal legislation, F.T.C. rulings, and court decisions concerning advertising regulations over dentists, lawyers, doctors, and optometrists.

D. The Determinants of Predatory Capture

Having established the interest groups concerned, we may now begin to explain the variations across states in the regulation under consideration. To this end I will turn to a discussion of the various hypotheses evolving from the predatory and Peltzman theories.

Following the work of Peltzman, I will maintain the assumption that the principal and indeed only goal of a legislator is to maximize the likelihood of his reelection.
Furthermore, the supply of regulation over any profession or industry group in a state is seen as being determined by the legislature in that state, who may either produce legislation directly or delegate their authority to a regulatory agency or board. In either event, and even in the case where the legislature allows for complete self-regulation, the final authority is in the hands of the legislature.⁸

Size of the Profession

A primary decision variable which is needed to explain the existing pattern of regulation in any setting is some measure of the size of the predatory group. As suggested by Stigler, the number of members in the profession is one measure of the potential demand for regulation in that it measures the number of votes that the group is able to offer to any legislator who supports their position. The absolute number of votes a profession is able to provide, though, would be a misleading indicator of the group's strength. A 1,000 member group demanding regulation in California, where the total population is approximately 19 million, certainly carries less weight than a group of the same size in Alaska, where the total population of the state is only roughly 300,000 or 1/60th of that of California. Consequently, a deflation factor is necessary to take account of the relative size of the group within its state.⁹ In any event, the number of members in the profession (e.g. dentists, optometrists) is
one vital measure of the strength of the "capturing group."

The Peltzman theory (and any model designed to test it) would also incorporate such a variable. The only difference to be found may come in the form of interpretation of the variable's meaning. In a Peltzman-like framework, where the legislator is the most important economic agent and therefore the focus of attention, the measure of the group's size would be interpreted as a measure of the costs to a legislator (in terms of votes forgone) of opposing the interests of the profession. It would therefore be seen as a variable which determines the legislator's willingness to provide regulation. The points of view of the two theories concerning this hypothesis differ but the net effect on the likelihood that the regulation is put into place will not. As we move across states we expect to find that as the (deflated) group size grows, so does the sensitivity of the legislator to the profession's interests. The first variable then, will in this way measure the likelihood that the pro-profession (predatory) regulation is in place.

**Group Organization**

As Stigler's work indicates, the ability of a group to acquire regulation depends not only on the size of that group but also on its effectiveness in the legislative marketplace. For Stigler, this translates into a question of how well organized the group is. A cohesive, well-organized group,
actively seeking its goal, is seen as being more likely to succeed than a poorly organized one. Here, two points need to be addressed.

The first, already discussed briefly, is that group organization is costly. There are costs involved in informing the members of the group of the issue at hand. There are costs involved in gathering the individuals together to devise a strategy. There are costs involved with implementing that strategy (whether it be to hire professional lobbyists or simply institute a letter writing campaign). All of these costs detract from the net wealth gain resulting from any acquisition, or capture, of regulation. A measure of the ease of coordination of the members, then, is expected to aid in the measurement of the costs to a group of capturing regulation.

The Stigler variable measuring the percentage of the group's members who live in urban areas will be used as such a measure. It is hypothesized that where large percentages of the predatory group live in urban areas, coordination is simplified. Equivalently, groups faced with the problem of having large percentages of their members widely dispersed in rural areas are certain to face higher organizational costs and greater difficulty in capturing regulation.

Secondly, as indicated above, the legislator is interested in obtaining votes. When a professional group (or its lobbyists) presents its position to the legislator(s) it will indicate the total number of members in the profession
and suggest this figure to be representative of the number of votes available to support a "friendly" legislator. The rational legislator may well assume that this figure accurately represents the costs to him, in terms of lost votes, of not supporting the group's demands.

But the legislator, as well as desiring votes, also desires non-vote support from the group (in the form of campaign contributions, organizational aid, etc.). Here the interests of the individual members and that of the group may diverge. An individual member of the profession may well be willing to vote for his own best interests since the cost of voting is very low.\(^{10}\) That same individual though may be much more likely to try to avoid any direct cash payment of campaign support. It is in his best interests to play the role of the free rider—to allow the other members to pay (campaign contributions, etc.) while he receives the benefits which all members will obtain if the favorable outcome is achieved.

The free rider problem is unquestionably an even more damaging problem facing the public, but the professional group also faces this problem. One may expect, for example, that individual dentists desire a no-reciprocity rule, and that the group as a whole prefers the rule, but in order to achieve the group's goal, it is the individual members of the group who must bear the burden. Consequently, individuals have an incentive to cheat on the group.

The free rider problem, then, can be interpreted as a cost
to the group of acquiring favorable regulation. The larger
the problem, the less non-vote support the group can generate
and therefore the more difficult predatory capture becomes.
Attempting to measure the free rider effect, as always, is a
difficult if not impossible task. Yet the same factors which
measure ease of coordination and organization of the group
also may help to indicate the extent of the free rider problem.
As well as being easier to inform and organize a group which
is located physically close to one another in urban areas, so
too it is an easier task to police individual member's non-
compliance with the group's goals. The successful coercion
of an individual to "pay for the ride" may be a positive
function of the amount of contact one has with his peers. For
the rural professional the only contact by the group may come
via the infrequent phone call or letter, whereas the urban pro-
fessional faces colleagues in person more frequently, and might
even be coerced, in dentistry for example, by facing possible
sanctions concerning hospital appointments for oral surgery.

Consequently, Stigler's measure of the percentage of
group members living in urban areas serves two purposes: 1) as
a measure (albeit imperfect) of the cost of coordination by a
group, and 2) as a measure of the cost of controlling the free
rider problem which faces the group. In both cases, as the
urbanization rate rises the coordination costs and free rider
costs fall and the expected impact on the probability of
predatory capture is positive.
Size of the Legislature

In some recent literature it has been suggested that there exist institutional features which may influence the ability of an interest group to capture regulation. Several characteristics of state legislatures have been examined but one in particular, legislature size, seems both reasonable and appropriate for use in the studies at hand.

Tollison and McCormick argue that the ability of a group to capture regulation is negatively related to the size of the legislature (number of members in the house plus senate in a state). The primary reason which they suggest for this relationship is that as a legislature's size grows, each individual legislator has less influence within the entire governing body. A "friendly" legislator (who perhaps has received campaign support from a group) has more impact, in a relative sense, on the total legislature's decisions in a state where the legislature is small than a similar legislator in a state where the legislature is large. They term this the "small fish in a big pond" effect. In an empirical test in which they seek to explain interstate differences in the number of occupations licensed, statistically significant results are found supporting the hypothesis that more predatory capture occurs in states with smaller legislatures.

Similarly, a different study by Janet Smith also generates support for this hypothesis. Smith argues, though, that the per capita size of the legislature is a more appropriate measure
of the group's ability to capture regulation. It is argued that the larger the number of legislators per capita, the closer will be the match between the desire of the entire population (rather than one interest group) and the actions of the legislature. This can best be seen in the extreme case where the number of legislators per capita equals 1 (where a referendum is used to decide an issue). In such a case a special interest group ordinarily would have a much more difficult time capturing regulation. Smith's study, seeking to explain interstate differences in the number of pieces of licensing legislation enacted, also generates empirical support for the hypothesis that predatory capture is negatively related to the (per capita) size of the legislature. Therefore we now have a third, this time institutional, variable which affects predatory capture and which (should and) will be included into any general model of regulatory capture.

E.) The Determinants of "Non-Capture": Public Interest Variables

The hypotheses examined in Section D.) above all deal with variables which are associated with the predatory capture theory of regulation. Each variable, it has been argued, adds to our understanding of the intensity of demand for regulation by a particular group and/or that group's ability to capture regulation.

Following the expanded model of regulation as proposed
by Peltzman, though, while all of these variables are important they do not comprise a complete set. Given the political support maximizing desires of the legislator, Peltzman's model argues that the legislator will take into account all other groups affected by a change in regulation, and their demands and influence as well. Therefore, the consuming public, as an interest group in these studies, now needs to be examined. An explanation of the additional hypotheses dealing with the public (consumer) demands and political strengths is presented below.

The public, as an interest group, is at a disadvantage as it is an extremely large group which has few, if any, organizations which can mobilize its members to take action favoring the group's interests. In addition, the sheer size of the group is a burden as the cost of detecting which individuals are "cheating" on the group is large if not prohibitive. Hence the size of the problem of the free rider effect is even greater than in the case of the professional interest group. Furthermore, the per capita gain (for those who in fact would not ride free) is often sufficiently small so as not to warrant the payment of the necessary costs. For these reasons, many involved in the field of regulatory theory support some version of the "predatory capture" theory of regulation.

Yet as we have seen, the profession does not always prevail. The public's interest is still maintained in several states. Hence Peltzman's work helps to describe what may be termed the "non-predatory capture" states. Given our definition
of predation as being the aggressive behavior on the part of an industry group, "non-capture" may now be defined as a situation where the legislature does not yield to the predator, but instead protects the interests of some other group.

Education

Two hypotheses explaining non-capture, both entirely consistent with Peltzman, now may be examined. First recall that Peltzman's model assumes that the legislator in effect must estimate the size of the competing groups and then assign probabilities to the support (or opposition) that the groups will generate. In his book entitled An Economic Theory of Democracy,16 Anthony Downs has generated ideas as to how the legislator determines these variables. Downs' work is very similar to Peltzman's17 although the former is largely descriptive while the latter is a more formal theoretical presentation. Quite clearly, Downs also perceives the regulatory world from the point of view of the rational vote maximizing legislator.

For Downs the information required by those involved in the legislative marketplace is a critical feature. He correctly suggests that for any individual to be informed fully he must acquire information as to: 1) which industries or professions are under consideration (or should be) for regulatory change, 2) how a given proposal would affect the group, and 3) where the legislator(s) stand on the issue.18
Furthermore he argues that the uninformed voter will have his interests less fully counted than the informed voter.\textsuperscript{19}

The reason for this is straightforward. To the support maximizing legislator, the cost of voting against the uninformed is less, at the margin, than the cost of voting against the informed. Indeed this is precisely what Peltzman has suggested in his model.\textsuperscript{20} It is expected then that the less informed the public is (in any state) the less likely its interests will be protected by the legislators in that state.

Measuring consumer information—especially in the legislative marketplace—is an extremely difficult task. The economic theory of information is not a particularly well developed field, although some insights from this area are helpful. As mentioned earlier, conventional wisdom has suggested that increased information (via advertising, etc.) helps lower search costs for consumers. More importantly, at least one study has generated empirical support for the hypothesis that efficiency of search and therefore the level of prices and the degree of price dispersion, depend in part on the education levels of consumers in the market.\textsuperscript{21} Although the study focused on consumers in a more conventional market (gasoline), it is neither difficult nor impractical to expand the analogy to include the legislative market. Just as education has an impact on consumers' information, which in turn affects producers' behavior vis-a-vis gasoline prices, similarly it can be argued that education has an impact on the public's
information achieved in the legislative market which in turn affects the legislature's behavior vis-a-vis regulation affecting the public.

Specifically, the members of the public with very low education levels are expected to have low levels of overall awareness of the legislative marketplace. Those individuals with little or no education are expected to be less informed as to the issues at hand, the positions taken by various legislators, and indeed are most likely less aware of even who the appropriate legislators are. Consequently, their demands are discounted heavily by the rational legislator. In states with higher percentages of uneducated members of the public, then, the likelihood that the public's interests are protected is diminished.

Voter Participation

There exists a second variable which also is expected to demonstrate the public's ability to succeed in the legislative market. Not only does a member of the public need to be informed, but it is also necessary that the legislator be made aware of the individual's understanding and interest in government policy decisions. In Downs' words, for any individual (x) to be able to influence policy,

"The government must be aware that x has preferences and know what they are. This means there must be communication from x to the government."\textsuperscript{22}

One measure by which legislators may measure the extent of
the public's interests in government policy decisions is the
degree of political activity undertaken by the public. The
simplest measure of this is the voter participation rate.
Low voter participation rates suggest apathy or disinterest
on the part of the public. High voter participation rates
indicate the opposite. Given rational legislators, it is
hypothesized that as voter participation rates rise, moving
across states, so, too, does the likelihood that regulation
protects the public's interests.23

The arguments for these two "public interest" variables
are closely related to one another but are in fact distinct.
The first hypothesis argues that a rational legislator ignores
or heavily discounts the uneducated and uninformed whether or
not they vote. The second hypothesis though, argues that the
legislator ignores any member of the public, informed or not,
who does not vote. For these two reasons then, the extent
of the public's interests is also expected to play a role in
determining the existing variation in regulation. As a
result, in addition to the other (predatory) variables and
hypotheses explained above, these two hypotheses should be
included in any empirical examination of the Peltzman theory
of regulation where the consuming public is an interest group.

F.) Intra-Industry Differences

As well as the variables cited above which are applicable
to a number of case settings, there may exist additional measures of demand intensity which are only applicable for particular studies. Such is the case for the two studies at hand where within each industry it can be argued that there exist competing interests which need to be modeled into the analysis of regulatory capture. For the optometry study, as mentioned above, a principal opposition eyeglass supplier is the optician. Here the intra-industry differences in types of suppliers creates a new opposition group whose political strength can be modeled in terms of a variable already cited—the voting strength of the group.

The dentistry study is somewhat different, though. As we have seen, all dentists in a market (state) where the more restrictive (no-reciprocity) rule is in effect will gain by receiving higher prices. Yet, there exist differences among dentists in their desire for the restrictive regulation. The specific regulation being examined, reciprocity, clearly affects labor mobility. Consequently, the dentists' demands for non-reciprocity statutes should also be affected by their desires for mobility. Some recent literature on human resource migration sheds some light on this area. Specifically, a 1976 study by Peter Pashigian on the effect of licensing on labor migration demonstrated the importance of one variable, age, on the desire for mobility. In particular, Pashigian states,

"Dentists, lawyers, optometrists, physicians, veterinarians, and others invest resources throughout their careers to develop business
reputations and goodwill. Reputation and knowledge of the market are in large part location specific and become obsolete when the practitioner leaves the immediate market area."24

Thus, the age of the professional (dentists) plays a role in determining the demand for mobility. Younger dentists, it is expected, have a lower opportunity cost, in the form of forgone goodwill, of relocating in a new state than the more established professionals. Recent dental school graduates and those who have been practicing for but a few years have invested less and will forgo less by relocating.25 The intensity of demand for non-reciprocity statutes then, is expected to be a function of the proportion of young dentists in a state. The smaller the proportion, the more support there will be for regulations prohibiting reciprocity and therefore the stronger will be the total group's demand for non-reciprocity statutes.

Furthermore, Shepard has suggested that professional attitude surveys indicate that older dentists, those considering partial retirement, "favor the improved mobility associated with reciprocity."26 From this information it is expected that the intensity of demand for non-reciprocity statutes in any state is also a function of the proportion of older dentists in that state. Again as this proportion decreases we expect to find more support for regulations prohibiting reciprocity and therefore more intense total group demand for non-reciprocity statutes.
Combining these two arguments allows us to establish one age distribution variable to capture both of these effects. As the proportion of those dentists in a state who are either relatively young or relatively old (and therefore hold stronger desires for mobility) falls, the intensity of demand for non-reciprocity statutes is expected to rise, and along with it the likelihood that such statutes are in fact in place also rises. This measure of the demand intensity of the predatory group in each state will therefore be included in the predatory capture model for dentistry, along with the other variables cited above.

In conclusion, in sections D.), E.), and F.) above we now have a set of variables which can be combined to create and test the Peltzman model. In addition, a predatory model can be created (for purposes of comparison) by simply including only those variables from section D.), along with the additional dentistry variable just examined. At this point we may now turn to an examination of the empirical models used to test these two capture theories and the resulting evidence found in the two case studies.
Footnotes for Chapter II

1 The source of a great deal of the following information is a Federal Trade Commission, Staff Report, Advertising of Ophthalmic Goods and Services, January, 1976.

2 Consequently 60% of ophthalmologists receive no income from dispensing. In addition, given that there exist several more specialized functions being provided by ophthalmologists, it is reasonable to assume that for the remaining 40% who do dispense some eyeglasses, the income generated is very small in proportion to their total incomes.


8 Even in this extreme case it is the legislature which decides that self-regulation is acceptable. It may, of course, alter that decision.

9 Stigler used total labor force although total population would seem to be more appropriate as it includes all those who are affected by the regulation. Stigler (1972), p. 14.

10 Voting is infrequent and therefore at each polling a number of legislative positions and referendum issues are determined. This being the case, the actual cost of voting on this one issue (time, transportation, expenses, etc.) can be spread out over the number of decisions made.

12 Ibid., Ch. III, p. 33
13 Ibid., Ch. III, pp. 52-53.
15 Tollison and McCormick make exactly this argument as well but (apparently) do not empirically test the hypothesis.
17 Indeed, as Downs' work preceded Peltzman's by nearly two decades it may be appropriate to invoke the name "The Downs-Peltzman" model.
19 Ibid., p. 248-49.
20 Recall from Peltzman's model that $f = 0$ is assumed when a beneficiary is ignorant of the issue. See footnote #30, Chapter I.
22 Downs, p. 250.
23 This again is clearly consistent with Peltzman's vote-maximizing model.
25 A section of Pashigian's work showed evidence that lawyers in relatively young/old age brackets did in fact have higher interstate migration rates. Ibid., p. 21.
26 Shepard, p. 191.
Chapter III
A.) Empirically Testing the Two Theories

In the previous chapter several hypotheses have been established which will allow for the specification of two testable models of regulatory capture for each of the two professions under study. The "predatory" capture theory seeks to explain the existing pattern of regulation within a framework of two sets of variables: 1) those measuring the professional group's intensity of demand for and/or costs of acquiring favorable regulation, and 2) institutional variables affecting the capturing group's ability to succeed in the legislative arena. Hence the predatory model can be written quite generally as

\[ C = F(X_1, X_2)^1 \]

The "Peltzman" capture theory seeks to expand on the "predatory" capture approach. The existing pattern of regulation can be explained in part, according to Peltzman, by examining the two sets of variables described by the "predatory" model, but the "predatory" model's specification is incomplete. What is required for a proper specification is the addition of a third set of variables measuring the sensitivity of the legislator to opposing groups. Looking at regulation from the point of view that the legislator is a rational political support maximizer, the inclusion of this third set of variables diminishes the obvious weakness of the predatory model--that one or more interested groups are completely ignored. The "Peltzman"
model then can be specified quite generally as

\[ C = G(X_1, X_2, R) \]

where \( R \), as defined earlier, is a vector of "opposition group" variables.

Of interest then is the relative abilities of the two models in explaining the existing pattern of regulation across states. Various methods for comparing the two specifications are available and the empirical work performed will be presented in the sections below. First though, in both of the cases being examined I seek to explain where (in which states) a particular regulation is (is not) in place. Consequently, the dependent variable (C) in each of the models is binary—either a state has a regulation in place (it is a predatory capture state) or it does not (it is a non-capture state). For cases such as these the OLS regression model is inappropriate. An appropriate technique is a PROBIT model.\(^2\)

**PROBIT Models**

Given the binary nature of the dependent variable, what one seeks to find in a model of the form \( C = F(X) \) is the conditional probability of the event, \( C \), given the values of the independent variable, \( X \). From the OLS technique a linear probability model easily can be generated. Given the standard OLS regression form,

\[ C_i = \alpha + \beta X_i + e_i \]

if the expected value operator is applied we find

\[ E(C_i) = P_i = \alpha + \beta X_i \]

where \( P_i \) is interpreted
as the probability that \( C_i = 1 \) (predatory capture) given \( X_i \).

Numerous problems arise from this model though.

First, the error structure for this model is not normally distributed. Although the mean value of the error term is \( E(e_i) = 0 \), the variance, \( \sigma^2 \), can be shown to be \( E(e_i^2) = E(C_i) \cdot [1 - E(C_i)] \) and hence the classical statistical tests of the parameters may not be applied. ⁴

Furthermore, predictions which are uninterpretable may also arise from such a model. In diagram #1 below, depicting the OLS model given a binary choice dependent variable, predicted probabilities such as \( \hat{C}_6 \) lie outside the 0, 1 interval. Given the set of observations \( X_1 \ldots X_6 \) we can see that for values of \( X > X_5 \) the predicted probability of predatory capture is greater than one—a statement which does not have a clear meaning.

The PROBIT model avoids these and other problems by transforming the \( X \) vector using the cumulative normal probability function. Using the PROBIT technique we have:
\[ C = G(Z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z} e^{-s^2/2} ds \text{ where } Z = \gamma + \beta X \]

Consequently, Z, a linear function of the original X vector, is transformed using the cumulative normal probability function (for PROBIT).\(^5\) Using this transformation we generate a reasonable set of probabilities as \(0 \leq C \leq 1\) must occur, by construction. In addition, the change in the probability is dependent on the level of the index Z—the regression line is curved as shown in diagram #2 below.

Diagram #2

The changing slope is more appealing in that it suggests that for large values of Z (such as \(Z_6\) where the probability of predatory capture approaches unity) a change in Z has little effect on the probability of predatory capture.

Finally, as well as generating predictions on the likelihood of predatory capture, the PROBIT model will generate the usual set of parameter estimates for the independent variables. These parameters are to be interpreted differently (as will be
shown) from their OLS counterparts, but have been shown to be consistent estimators. Using the PROBIT model I will now examine the two theories of regulatory capture as they apply to dentistry and optometry.

B.) Dentistry Results

Data and Measurement of the Variables

As the present models of the capture of dentistry regulation are an attempt to expand upon the earlier study by Shepard, the present study will look at the 1970 cross-state pattern of regulations as well. The dependent variable, once again, is binary. States are defined as predatory capture states (where no reciprocity exists) or non-capture states (where reciprocity exists). The information concerning reciprocity comes from the 1970 American Dental Association Directory and Shepard's study. Forty-eight states are examined. The remainder of the data used in this study came from a variety of government sources.

Data for the first two predatory capture variables are from 1970 Census data for selected health occupations. The first variable, DENTIST, is a measure of the per capita number of dentists in each state. The second, % URBAN, is measured as the proportion of dentists in each state who live in urban areas. The third variable, % MOBILE, is constructed from data in a 1970 Department of Health, Education and Welfare
(H.E.W.) study. For this variable, recall that we desire a measure of the proportion of dentists in each state who are either young or old and therefore desire more mobility. The H.E.W. study classified data into three age groups: the percentage of dentists under age 35, under age 45, and over age 45. The variable constructed for this study was the sum of the first and third groups. A more accurate measure would perhaps set the older age group at age 50 or 55 but such data were not available. Finally, the fourth predatory capture variable, LSIZE, is the measure (as suggested by Tollison and McCormick) of the size of the legislature and is measured as the total number of members in the house plus senate in each state's legislature. The source of the data for this variable is the 1970 Governmental Affairs Institute publication entitled, America Votes.

Data for the two additional variables tested in the Peltzman model are from different sources. First, VPR, is a measure of the 1970 voter participation rate in each state. This variable is a measure of the percent of the population who voted in statewide elections. As 1970 was not a national election year (when voter participation rates are typically substantially different) this measure should closely represent the extent of political interest/activity of the public in state legislative activity. The source of these data is the Statistical Abstract of the U.S.

Finally, % UNED is measured by the percent of the
population over 25 years of age having zero years of education. The data for this variable come from the 1970 U.S. Census of Population. This group includes individuals such as migrant workers, those growing up during the depression who received no formal education, the institutionalized, and any individual beyond the age of 52 who chose to forgo an education. Its members are almost certainly ignorant of legislative activity as they are likely to be illiterate. The measure, therefore, closely follows the simple Peltzman hypothesis (and that of Downs) as this entire group is expected to be ignored by the rational legislator.

It should be noted that this measure does not account for any interaction between the legislator and his constituents (e.g. a legislator using the media to "sell" his position with respect to an issue). Additional analysis of the economics of information transmission, especially with respect to the legislative market, and of an appropriate measure of the transmission and its effect on decision making, is likely to further advance the theory of regulation.

**Empirical Results**

The PROBIT analysis results for the two capture theory models are presented in Tables I and II below. As these tables show, parameters for all of the variables except one are of the appropriate sign. Furthermore, substantial support is generated for the superiority of the Peltzman model.
TABLE I: CAPTURE BY DENTISTS

Dependent Variable

1 if reciprocity does not exist (= predatory capture)
\[ C = \]
0 otherwise (= non-capture)

TEST I: PREDATORY MODEL

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Expected Sign</th>
<th>( \hat{\beta} )</th>
<th>t-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) ( X_1 = \text{DENTIST} )</td>
<td>( \beta_1 &gt; 0 )</td>
<td>0.036</td>
<td>1.37*</td>
</tr>
<tr>
<td>2) ( X_2 = %\text{URBAN} )</td>
<td>( \beta_1 &gt; 0 )</td>
<td>0.722</td>
<td>0.32</td>
</tr>
<tr>
<td>3) ( X_3 = %\text{MOBILE} )</td>
<td>( \beta_1 &lt; 0 )</td>
<td>-0.182</td>
<td>-2.77***</td>
</tr>
<tr>
<td>4) ( X_4 = \text{LSIZE} )</td>
<td>( \beta_1 &lt; 0 )</td>
<td>-0.002</td>
<td>-0.87</td>
</tr>
<tr>
<td>5) ( \text{CONSTANT} )</td>
<td></td>
<td>-11.567</td>
<td>-2.52***</td>
</tr>
</tbody>
</table>

Likelihood Ratio Test = 12.90**
Correct Predictions = 68.75%
\( R^2 \) = .2122

* = Significant at .10
** = Significant at .05
*** = Significant at .01
TABLE II: CAPTURE BY DENTISTS

Dependent Variable

\[ C = \begin{cases} 1 & \text{if reciprocity does not exist (}= \text{predatory capture}) \\ 0 & \text{otherwise (}= \text{non-capture}) \end{cases} \]

TEST II: PELTZMAN MODEL

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Expected Sign</th>
<th>( \hat{\beta} )</th>
<th>t-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) ( X_1 = \text{DENTIST} )</td>
<td>( \beta^E_1 &gt; 0 )</td>
<td>0.113</td>
<td>2.54***</td>
</tr>
<tr>
<td>2) ( X_2 = %\text{URBAN} )</td>
<td>( \beta^E_2 &gt; 0 )</td>
<td>-4.38</td>
<td>-1.44*</td>
</tr>
<tr>
<td>3) ( X_3 = %\text{MOBILE} )</td>
<td>( \beta^E_3 &lt; 0 )</td>
<td>-0.206</td>
<td>-2.76***</td>
</tr>
<tr>
<td>4) ( X_4 = \text{LSIZE} )</td>
<td>( \beta^E_4 &lt; 0 )</td>
<td>-0.003</td>
<td>-0.79</td>
</tr>
<tr>
<td>5) ( X_5 = \text{VPR} )</td>
<td>( \beta^E_5 &lt; 0 )</td>
<td>-0.041</td>
<td>1.35*</td>
</tr>
<tr>
<td>6) ( X_6 = %\text{UNED} )</td>
<td>( \beta^E_6 &gt; 0 )</td>
<td>0.731</td>
<td>1.76**</td>
</tr>
<tr>
<td>7) CONSTANT</td>
<td></td>
<td>-15.019</td>
<td>-2.70***</td>
</tr>
</tbody>
</table>

Likelihood Ratio Test = 22.67**
Correct Predictions = 81.25%
\( R^2 = .3978 \)

* = Significant at .10
** = Significant at .05
*** = Significant at .01
In the predatory capture model two of the four independent variables are statistically significant. Support is found for the "voting strength of the capturing group" hypothesis as the DENTIST coefficient is correctly signed and significant at the .10 level. In addition, the labor mobility variable is strongly significant, supporting the hypothesis that age distribution differences affect the desire for mobility and therefore the demand for reciprocity. The Tollison hypothesis is only weakly supported here as the LSIZE coefficient is correct in sign but insignificant.\(^{14}\) Finally, the % URBAN variable's coefficient, while of the correct sign, is insignificant in this model. A likelihood ratio test was performed as a test of the significance of the set of variables together. The test that \(\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0\) is rejected at the .05 level of significance.

In the Peltzman capture model five of the six variables tested were found to be significant. Of greatest interest are the two additional "public" variables. Both VPR and % UNED are appropriately signed and statistically significant. Hence initial support for Peltzman's model is generated.

A more conclusive, and more informative test may be constructed though. The joint test that \(\beta_5 = \beta_6 = 0\), and therefore that the predatory model and not the Peltzman model is correct, can be performed using the following test statistic:\(^{16}\)

\[
2[\ln \Lambda_W - \ln \Lambda_r] \quad \text{where } \ln \Lambda_W \text{ is the natural log of the}
\]
likelihood function for the constrained (predatory) model while $\ln \lambda_1$ is the natural log of the likelihood function for the unconstrained (Peltzman) model.

The calculated value of the test statistic (which is distributed $\chi^2$) is 9.766 which exceeds the critical value at the .01 level of significance. Consequently we may reject the hypothesis that $\beta_5 = \beta_6 = 0$. The theory of the rational legislator paying attention to the public as well as the profession is clearly supported. More strongly, we may reject the hypothesis that the "predatory" model is the correct model and that Peltzman's model adds nothing new to the analysis.

The interpretation of the coefficients must be done with some caution as they differ from OLS coefficients. Recall that in using PROBIT analysis the original $C = F(x)$ is transformed into $C = G(Z)$ where $Z$ is an index created as a linear combination of the $X$'s. Any parameter coefficient which PROBIT generates measures the effect of a change in an independent variable, $X_i$, on the index, $Z$. To find the effect of a change in $X_i$ on the probability of predatory capture it follows that we must also find the effect of a change in the index $Z$ on the probability of capture and then multiply this by $\beta_i$, the effect of a change in $X_i$ on $Z$. As noted earlier, the effect of a change in $Z$ on the probability of predatory capture depends upon the value of $Z$ chosen. Conventionally, $Z$ is evaluated at the mean of the $X$ vector.

For example, the $\beta_5 = -0.04$ for the first (new)
Peltzman variable, VPR, does not indicate that a 1 unit change in VPR leads to a 4 percent change in the probability of predatory capture. Instead $\beta_5 = -0.04$ indicates that a 1 unit change in VPR leads to a $-0.04$ change in the index $Z$, created by PROBIT. With the proper transformation we find that a 1 unit increase in VPR, evaluated at the mean, results in a 1.23 percent decrease in the probability of predatory capture.

One disturbing result of the empirical test of Peltzman's model is the $\%$ URBAN variable. This variable was designed to measure the ease of organization for dentists. The PROBIT results show an incorrect (negative) sign for the $\%$ URBAN coefficient and the variable is significant at the .10 level. This perplexing result may be due to either of two distinct reasons. First, between tests I and II two new variables have been added. Consequently it is possible that an interaction between VPR and/or $\%$ UNED and $\%$ URBAN is occurring which is causing the improper $\beta_2$ sign.

Alternatively, the argument can be made that the Peltzman specification is appropriate and the $\%$ URBAN variable encompasses some additional unwanted effects. For example, if the percent of dentists living in urban areas is correlated with the percent of the total population living in urban areas, the ease of coordination of the public (and perhaps the sophistication of this group as well) may be greater where $\%$ URBAN is large. If so, a negative $\beta_2$ is possible. In any event the initial hypothesis is not supported.
An overall initial comparison of the two models then suggests that while the "predatory" model is of some merit, the Peltzman model, with its additional variables, is preferred. Quite simply, the "predatory" capture theory omits two statistically significant variables. In addition to the individual significance of each variable added, the likelihood ratio test for Peltzman's model, testing the hypothesis that $\beta_1 = \beta_2 = \ldots = \beta_6 = 0$, is rejected at an even greater level of significance than in the "predatory" model. This as well indicates the importance of the two new variables.

Third, the explanatory power of the two models can be shown to differ considerably. The measure of $R^2$ between observed and predicted $\hat{C}$'s for the Peltzman model is nearly twice that of the "predatory" model. The use of $R^2$ in PROBIT analysis must be done with caution though, as it has been demonstrated that this measure is not fully indicative of the explanatory power of the model.

Morrison\textsuperscript{18} has demonstrated that for binary dependent variable cases, $R^2$ has an upper bound which may be considerably less than unity. His reasoning stems from the following equation:

$$R^2 = \frac{\text{PREDICTED VALUES}}{\text{ACTUAL OUTCOMES}} = \frac{\text{PREDICTED}}{\text{TRUE}} \times \frac{\text{TRUE}}{\text{ACTUAL}}$$

Hence $R^2$ can be seen as being comprised of two components. This being the case, even if a perfect model is specified (and the predicted values exactly match the true values)
the value of \( R^2 \) may still fall below unity. This is so because the exact distribution of the true probabilities is unknown. Unless it is binary, the second term is necessarily less than unity.

Given that the true probability distribution is unknown, the \( R^2 = 0.3978 \) for Peltzman's model does not indicate that the model explains \( 0.3978 \) of the variation in "C", unless the true probability distribution is binary. If it is not binary then the upper bound for \( R^2 \) is less than unity, and in this event the \( R^2 \) measure can be seen as a lower limit of the explanatory power of the model. Given this difficulty with \( R^2 \) its usefulness in PROBIT models is limited.

The Explanatory Power of the Two Models

Fortunately, alternative methods of comparing the explanatory power of the two models are available. These are presented in table III. From the PROBIT model \( C = G(Z) \), a predicted value, \( \hat{C} \), is generated for each of the observations (states) in the sample. In table III these predicted values have been compiled for both the "predatory" and Peltzman models. After ranking the predicted values by order of magnitude (see table IV) the data has been grouped into five categories -- from the "top 10" predicted values to the "final 8" predicted values. As the highest values are to be associated with states with the highest likelihood of "predatory" capture, in an accurate model we would expect to find a large percentage of the "top 10" states are in fact
predatory capture states. Table III demonstrates the performance of the models being compared.

First a "naive" model is constructed under the assumption that no information as to the magnitude of the observations for any of the "predatory" or Peltzman independent variables is available. In this case, given that 32 of the 48 states are in fact predatory capture states \( (C_j = 1) \), the naive model would simply predict that out of any group, 32/48 or 66.6% of that group would be capture states. From table III it can be seen that both models of regulatory capture are preferred to the naive model. In the "top 10" group, as predicted by the Peltzman model, there is 100% accuracy as all 10 states are in fact predatory capture states. In other words, if we are given information about the several variables which Peltzman's theory deems important, we are able to choose ten states (the Peltzman "top 10") and be 100% accurate, for this sample, whereas the naive model, without this information, would randomly choose 10 states and (on average) be only 66.6% accurate. In comparison with the naive model, then, Peltzman's model here is a clear improvement. Similarly, the "top 10" predictions for the predatory model do equally well.

A comparison of the Peltzman and predatory models for the four other groups, though, demonstrates that the Peltzman model is preferred. In the "2nd 10" group, 90% of the Peltzman states are in fact capture states while 80% of the predatory
### TABLE III: EXPLANATORY POWER OF THE MODELS:

**DENTISTRY STUDY**

<table>
<thead>
<tr>
<th></th>
<th>Naive</th>
<th>Predatory</th>
<th>Peltzman</th>
<th>Peltzman Constrained</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top 10</strong></td>
<td>66.6%</td>
<td>100% predatory capture</td>
<td>100% predatory capture</td>
<td>100% predatory capture</td>
</tr>
<tr>
<td>2nd 10</td>
<td>66.6%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
</tr>
<tr>
<td>3rd 10</td>
<td>66.6%</td>
<td>40%</td>
<td>80%</td>
<td>50%</td>
</tr>
<tr>
<td>4th 10</td>
<td>66.6%</td>
<td>70%</td>
<td>30%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Final 8</strong></td>
<td>66.6%</td>
<td>37.5%</td>
<td>25%</td>
<td>37.5%</td>
</tr>
</tbody>
</table>

% Correct Predictions: 68.75% correct, 81.25% correct, 79.16% correct

Top 32: 75% capture, 87.5% capture, 81.25% capture

Rank Correlation: $r = .7975$ and $r = .8340$
<table>
<thead>
<tr>
<th>Predatory Model</th>
<th>Peltzman Model</th>
<th>Peltzman Constrained Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{C}_i$</td>
<td>$C_i$</td>
<td>$\hat{C}_i$</td>
</tr>
<tr>
<td>1) .999</td>
<td>.999</td>
<td>.999</td>
</tr>
<tr>
<td>2) .996</td>
<td>.999</td>
<td>.999</td>
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<tr>
<td>3) .996</td>
<td>.998</td>
<td>.998</td>
</tr>
<tr>
<td>4) .981</td>
<td>.984</td>
<td>.993</td>
</tr>
<tr>
<td>5) .960</td>
<td>.981</td>
<td>.992</td>
</tr>
<tr>
<td>6) .956</td>
<td>.976</td>
<td>.975</td>
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<td>7) .953</td>
<td>.973</td>
<td>.965</td>
</tr>
<tr>
<td>8) .950</td>
<td>.972</td>
<td>100%</td>
</tr>
<tr>
<td>9) .948</td>
<td>predatory</td>
<td>.962</td>
</tr>
<tr>
<td>10) .922</td>
<td>capture</td>
<td>.959</td>
</tr>
<tr>
<td>11) .909</td>
<td>.956</td>
<td>.958</td>
</tr>
<tr>
<td>12) .873</td>
<td>.956</td>
<td>.940</td>
</tr>
<tr>
<td>13) .850</td>
<td>.948</td>
<td>.893</td>
</tr>
<tr>
<td>14) .813</td>
<td>.940</td>
<td>.892</td>
</tr>
<tr>
<td>15) .799</td>
<td>.937</td>
<td>.887</td>
</tr>
<tr>
<td>16) .798</td>
<td>.922</td>
<td>.886</td>
</tr>
<tr>
<td>17) .787</td>
<td>.902</td>
<td>.885</td>
</tr>
<tr>
<td>18) .777</td>
<td>80%</td>
<td>.894</td>
</tr>
<tr>
<td>19) .766</td>
<td>predatory</td>
<td>.879</td>
</tr>
<tr>
<td>20) .751</td>
<td>capture</td>
<td>.879</td>
</tr>
<tr>
<td>21) .747</td>
<td>.877</td>
<td>.845</td>
</tr>
<tr>
<td>22) .733</td>
<td>.841</td>
<td>.772</td>
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<tr>
<td>23) .727</td>
<td>.798</td>
<td>.765</td>
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<td>24) .717</td>
<td>.777</td>
<td>.749</td>
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<tr>
<td>25) .686</td>
<td>.730</td>
<td>.734</td>
</tr>
<tr>
<td>26) .685</td>
<td>.727</td>
<td>.734</td>
</tr>
<tr>
<td>27) .633</td>
<td>.691</td>
<td>.730</td>
</tr>
<tr>
<td>28) .630</td>
<td>40%</td>
<td>.680</td>
</tr>
<tr>
<td>29) .606</td>
<td>predatory</td>
<td>.635</td>
</tr>
<tr>
<td>30) .600</td>
<td>capture</td>
<td>.628</td>
</tr>
<tr>
<td>31) .599</td>
<td>.594</td>
<td>.679</td>
</tr>
<tr>
<td>32) .588</td>
<td>.593</td>
<td>.602</td>
</tr>
<tr>
<td>33) .566</td>
<td>.593</td>
<td>.589</td>
</tr>
<tr>
<td>34) .533</td>
<td>.532</td>
<td>.517</td>
</tr>
<tr>
<td>35) .515</td>
<td>.504</td>
<td>.467</td>
</tr>
<tr>
<td>36) .503</td>
<td>.474</td>
<td>.452</td>
</tr>
<tr>
<td>37) .501</td>
<td>.414</td>
<td>.419</td>
</tr>
<tr>
<td>38) .486</td>
<td>70%</td>
<td>.304</td>
</tr>
<tr>
<td>39) .482</td>
<td>predatory</td>
<td>.290</td>
</tr>
<tr>
<td>40) .469</td>
<td>capture</td>
<td>.285</td>
</tr>
<tr>
<td>41) .444</td>
<td>.222</td>
<td>.245</td>
</tr>
<tr>
<td>42) .421</td>
<td>.211</td>
<td>.243</td>
</tr>
<tr>
<td>43) .321</td>
<td>.178</td>
<td>.230</td>
</tr>
<tr>
<td>44) .287</td>
<td>.175</td>
<td>.219</td>
</tr>
<tr>
<td>45) .235</td>
<td>.139</td>
<td>.212</td>
</tr>
<tr>
<td>46) .217</td>
<td>37.5%</td>
<td>.133</td>
</tr>
<tr>
<td>47) .178</td>
<td>predatory</td>
<td>.117</td>
</tr>
<tr>
<td>48) .164</td>
<td>capture</td>
<td>.018</td>
</tr>
</tbody>
</table>
"2nd 10" group are capture states. In the "3rd 10" group, 80% of Peltzman's states are capture states while only 40% of the predatory "3rd 10" group are capture states. The superior performance of the Peltzman model in the final two groups (where, it turns out, non-capture is widely predicted as most C's are C < .5) is also demonstrated as in both cases the Peltzman model predicts less captures than the predatory model and the naive model. An especially troubling result for the predatory model lies in the "4th 10" group, where fully 70% of the states in this group were predicted to be capture states.

Two summary statistics are also included in table III. The first is the correct predictions rate. Here, a prediction is accepted as being correct if C > .5 is observed in a state where predatory capture (C = 1) is in fact the case, or if C < .5 is observed in a non-capture (C = 0) state. Using this summary measure the Peltzman model maintained an 81.25% correct predictions rate. The predatory model's correct predictions rate was 68.75%. Thus the "predatory" model is only slightly better than the naive model (66.6% correct) while the Peltzman model clearly dominates both.

As a second summary statistic, if we focus on the top 32 predicted values for each model (since there are 32 capture states) we see that the Peltzman model is again superior. While 75% of the "predatory" "top 32" are in fact capture states, fully 87.5% of the Peltzman "top 32" are capture states.
As a final method of comparing the two models, a rank correlation coefficient, $r$, is calculated using a ranking of the states according to the predicted $C_1$'s from the Peltzman and Predatory models (p. 17 above). The $r = +.7975$ demonstrates that the two rankings are positively correlated. In addition, the null hypothesis that the rankings are independent is rejected at the .01 level. Given this, the measure appears to be in conflict with the remaining statistical results. In part this is true, yet the rank correlation measure only indicates that the rankings are correlated.

The remaining tests (above) are more detailed indicators of the accuracy of each ranking. Thus, although the ranking of the Peltzman and Predatory models are positively related to one another the Peltzman model remains more accurate.

Finally, as the Peltzman model has one argument, % URBAN, with an inappropriately signed coefficient ($\hat{\beta}_2 < 0$) the model was retested with $\hat{\beta}_2$ constrained to $\hat{\beta}_2 = 0$. The final column in table III ("Peltzman constrained") reports the results for this model. In this final version, in both the "top 10" and "2nd 10" groups, 100% of the states are in fact capture states, an improvement over the unconstrained model, but the summary statistics of the full Peltzman model are slightly better. The comparison between the two models (Peltzman and predatory) though, is not substantially changed. In sum, the predatory model is a mild improvement over the naive model. The Peltzman model is clearly superior to both.
C.) **Optometry Results**

**Data and Measurement of the Variables**

In the second case study I seek to explain the existing pattern of regulation over price advertising in the retail sector of the prescription eyeglasses industry. The dependent variable is again binary. States are defined as predatory capture states if opticians are not allowed to price advertise or non-capture states if opticians are allowed to price advertise. The information concerning these advertising regulations comes from a search of the 1970 optometry laws of the various states. Forty-five states are examined.  21

In this study the impact of a number of interest groups is examined. The professionals, optometrists, whom Benham claims have captured the regulations are measured first with the variable OPTIMPOP, which is a measure of the per capita number of optometrists in each state. The source for these data was an H.E.W. report on selected health occupations. 22 Secondly, their organizational abilities, URBOPIM% is measured as in the first study.

The first opposition group variable, OPTCPPOP, is a measure of the per capita number of opticians working in either commercial firms or department stores in a state. The data here are from a similar H.E.W. report. 23 Finally, the AGENPOP variable is a measure of the per capita number of employees in advertising agencies in each state. These data come from the
1970 U.S. Census publication, County Business Patterns. The definitions and sources of data for the remaining variables (LSIZE, VPR, and % UNED) are the same as in the dentistry study.

**Empirical Results**

The PROBIT analysis results for the two competing capture theory models are presented in tables V and VI below. As these tables show, parameters for all of the variables except one, AGEPUP, are of the appropriate sign. In the predatory capture model, though, none of the variables tested is significant at the .10 level of significance. Only the organizational variable, UROPTIM%, is close, being significant at the .15 level. Furthermore, the likelihood ratio test that $\beta_1 = \beta_2 = \beta_3 = 0$ can not be rejected even at the .50 level. Further evidence of the weakness of this model is demonstrated in the $R^2 = .0382$ value.

In sharp contrast, several of the variables in the Peltzman model are statistically significant. In the column labeled "Peltzman #1" we see that four of the seven variables tested are significant. First, OPTCPop, the measure of optician opposition is correctly signed and significant at the .10 level. Using the appropriate transformation (as described above) the value $\hat{\beta}_3 = 0.224$ may be interpreted as indicating that a 1 unit increase in OPTCPop, evaluated at the mean, lowers the likelihood of capture by 8.6%.
TABLE V: CAPTURE BY OPTOMETRISTS

Dependent Variable

1 if opticians are not allowed to price advertise (non-capture)

\[ Y = \]

0 otherwise (non-capture)

TEST I: PREDATORY MODEL

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Expected Sign</th>
<th>[ \hat{\beta} ]</th>
<th>t-Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) [ X_1 = \text{OPTPPOP} ]</td>
<td>[ \beta_1^E &gt; 0 ]</td>
<td>0.005</td>
<td>0.088</td>
</tr>
<tr>
<td>2) [ X_2 = \text{URBOPTIM} % ]</td>
<td>[ \beta_2^E &gt; 0 ]</td>
<td>2.551</td>
<td>1.258+</td>
</tr>
<tr>
<td>3) [ X_3 = \text{LSIZE} ]</td>
<td>[ \beta_3^E &lt; 0 ]</td>
<td>-0.001</td>
<td>-0.498</td>
</tr>
<tr>
<td>4) [ \text{CONSTANT} ]</td>
<td></td>
<td>-1.799</td>
<td>-0.982</td>
</tr>
</tbody>
</table>

Likelihood Ratio Test = 1.88
Correct Prediction = 55.5%
\[ R^2 \] = 0.0382

* = Significant at .10
+ = Significant at .15
TABLE VI: CAPTURE BY OPTOMETRISTS

Dependent Variable

1 if opticians are not allowed to price advertise
(predatory capture)
\[ y = \]
0 otherwise (non-capture)

TEST II: PELTMAN MODELS

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Expected Sign</th>
<th>Peltzman #1</th>
<th>Peltzman #2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \beta^E )</td>
<td>( \hat{\beta} ) t-Ratio</td>
<td>( \hat{\beta} ) t-Ratio</td>
</tr>
<tr>
<td>1) ( X_1 = OPTIMPOP )</td>
<td>( &gt; 0 )</td>
<td>0.154 1.36*</td>
<td>0.158 1.40*</td>
</tr>
<tr>
<td>2) ( X_2 = URBOPTIM )</td>
<td>( &gt; 0 )</td>
<td>0.742 0.29</td>
<td>0.509 0.19</td>
</tr>
<tr>
<td>3) ( X_3 = LSIZE )</td>
<td>( &lt; 0 )</td>
<td>-0.003 -1.111</td>
<td>-0.004 -1.17</td>
</tr>
<tr>
<td>4) ( X_4 = OPTCPOP )</td>
<td>( &lt; 0 )</td>
<td>-0.224 -1.61*</td>
<td>-0.194 -1.30*</td>
</tr>
<tr>
<td>5) ( X_5 = VPR )</td>
<td>( &lt; 0 )</td>
<td>-0.034 -1.04</td>
<td>-0.033 -0.98</td>
</tr>
<tr>
<td>6) ( X_6 = %UNED )</td>
<td>( &gt; 0 )</td>
<td>0.694 1.79**</td>
<td>0.717 1.84**</td>
</tr>
<tr>
<td>7) ( X_7 = AGENPOP )</td>
<td>( &lt; 0 )</td>
<td>0.038 1.64*</td>
<td>0.026 0.79</td>
</tr>
<tr>
<td>8) ( X_8 = INTER )</td>
<td>( &gt; 0 )</td>
<td>( -0.627 -0.24 )</td>
<td>( -0.467 -0.81 )</td>
</tr>
</tbody>
</table>

Likelihood Ratio Test = 14.19**
Correct Predictions = 71.11%
\( R^2 = .2606 \)

---

* = Significant at .10
** = Significant at .05
Second, the "legislator ignores the uninformed voter" hypothesis is once again strongly supported as UNED is significant at the .05 level. Third, the "predatory capture" variable, OPTMPOP, here becomes significant. The improved status of this variable over its insignificant level in the predatory model again is indicative of the superiority of the Peltzman model. If the capture theory in any form is of merit, we expect OPTMPOP to be an important variable. Its surprising lack of significance in the predatory model may well be a result of a mis-specification bias due to the omission of the several additional variables needed in a properly specified (Peltzman) model.

To complete the comparison of the predatory and Peltzman models' variables and to demonstrate the superiority of the latter model's specification one additional test is performed. Using the test statistic described earlier, the hypothesis that \( \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0 \) is tested. The test statistic's value is 7.84 which exceeds the critical value at the .05 level of significance and therefore the above hypothesis is rejected. In other words the hypothesis that the additional Peltzman variables are as a group insignificant and add nothing to the predatory model is rejected. This combined with the favorable likelihood ratio test result for the Peltzman model (the hypothesis that \( \beta_1 = \beta_2 = \ldots = \beta_7 = 0 \) is also rejected) and the unfavorable result for the predatory model for the same test generates conclusive support for the superiority of
the Peltzman model in the study at hand.

Finally, the seventh variable, AGENPOP, is disappointing as it is improperly signed and significant. The variable, measuring the per capita number of employees in advertising agencies was expected to show the voting strength, and therefore opposition by this group, to advertising restrictions. The difficulty with AGENPOP is that it is weak measure of the true interest group and its influence. A primary problem is that of diverging interests among advertising agencies. The agencies most interested in the relatively small, local accounts would most likely be the smaller local firms. For these firms often the small advertising campaigns are their major source of revenues. Many of the largest advertising agencies, though, focus solely or largely on interstate, national or international accounts. In states (New York, Illinois, etc.) where this occurs the AGENPOP value is very high while interest in the narrow issue of advertising by opticians may be quite low. Unfortunately, data concerning employment in small advertising agencies alone is not available due to disclosure laws. To the extent that large advertising agencies (or any agencies that deal principally in out-of-state activities) dominate the measure of AGENPOP, then, the measure's accuracy is diminished.

To demonstrate the problem with AGENPOP a second model is tested (Peltzman #2) in which an interaction term is entered. In particular, the new term INTER is defined simply as
(AGENPOP) \cdot (POP). The new INFER term uses POP (state population) for several reasons. First, the size and number of large (and therefore disinterested) advertising agencies is closely correlated with the measure of state population. Secondly, the more heavily populated states tend to coincide with the greatest number of advertising agencies which deal with interstate or international accounts or agencies created to service one account. Third, POP also helps to demonstrate that in the most heavily populated areas the number of ad agency employees is larger than the number of potential votes in a state as employees may live in adjacent states (again, New York and Illinois are primary examples.)

In the Peltzman #2 model the new derivative \[ \frac{\partial C}{\partial X_7} = \hat{\beta}_7 + \hat{\beta}_8 \cdot POP. \] The positive value of \( \hat{\beta}_8 \) indicates that \( \frac{\partial C}{\partial X_7} \) is overstated in that \( \hat{\beta}_7 \) is higher in states where POP (and therefore less interest in regulation than AGENPOP suggests) is high. This test does not by itself demonstrate that \( \hat{\beta}_7 < 0 \) (as the Peltzman model would predict) but that AGENPOP is inaccurate and a more accurate measure may result in \( \hat{\beta}_7 < 0. \)

**Explanatory Power of the Two Models**

In tables VII and VIII a comparison of the explanatory power of the models is presented for optometry. The naive model is constructed under the assumption that no information as to the magnitude of any of the predatory or Peltzman
variables is available. Here, as 25 of the states are in fact capture states the naive model would predict that 25/45 or 55.5% of any group of states would in fact be capture states.

From the table we can first of all see the weak performance of the predatory model. Of the "top 10" group, 80% are correctly predicted as capture states. For the "2nd 10" group, though, which should be heavily dominated by capture states as well, only 20% are in fact capture states. At the other end of the spectrum, in the "final 5" category which should have no capture states at all, 40% of the states are captured. The overall performance of the model, as seen in the summary statistics, is also poor. First, only 60% of the "top 25" states are in fact capture states. More important, though, is that only 55.5% of all states were correctly predicted. Consequently, the predatory model, according to the latter measure, does no better at all than the naive model.

The performance of the Peltzman (#1) model is again substantially better. Of the "top 10" group, 90% are capture states while 60% of the states in the "2nd 10" group are capture states. Furthermore, in the "final 5" category a sharp improvement over the predatory model is seen in that none of these states (for Peltzman) are captured. Again perhaps the clearest evidence of the superior performance of the Peltzman model lies in the two summary statistics. First, of the "top 25" group, 72% of the states are capture
### TABLE VII: EXPLANATORY POWER OF THE MODELS

**OPTOMETRY STUDY**

<table>
<thead>
<tr>
<th></th>
<th>Naive</th>
<th>Predatory</th>
<th>Peltzman</th>
<th>Peltzman Constrained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 10</td>
<td>55.5% predatory capture</td>
<td>80% predatory capture</td>
<td>90% predatory capture</td>
<td>70% predatory capture</td>
</tr>
<tr>
<td>2nd 10</td>
<td>55.5%</td>
<td>20%</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>3rd 10</td>
<td>55.5%</td>
<td>90%</td>
<td>60%</td>
<td>70%</td>
</tr>
<tr>
<td>4th 10</td>
<td>55.5%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Final 5</td>
<td>55.5%</td>
<td>40%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Correct Predictions</th>
<th>55.5% correct</th>
<th>71.11% correct</th>
<th>75.5% correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 25</td>
<td>60% capture</td>
<td>72% capture</td>
<td>72% capture</td>
</tr>
<tr>
<td>Rank Correlation r</td>
<td>.4188</td>
<td>.4220</td>
<td></td>
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TABLE VIII
PREDICTED AND OBSERVED VALUES OF C: OPTOMETRY

<table>
<thead>
<tr>
<th>Predatory Model</th>
<th>Peltzman Model</th>
<th>Peltzman Constrained Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_i )</td>
<td>( \hat{C}_i )</td>
<td>( \hat{C}_i )</td>
</tr>
<tr>
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<tr>
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<td>45) .213 0 capture</td>
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states. Secondly, the Peltzman model correctly predicts 71.1% of all states, which is 15% more states correctly predicted than either the predatory or naive model.

Finally, once again a rank correlation coefficient is calculated from the $C_i$'s in the two models. Here the value $r = +.4220$ demonstrates a much weaker positive correlation between the predatory and Peltzman (constrained) models' rankings than was the case for the dentistry study. 27

The final column, "Peltzman constrained," is the Peltzman model with the (inappropriately signed) AGENPOP variable constrained such that $\hat{\beta}_7 = 0$. The weaker performance of this model in the "top 10" group is disappointing (and shows the need for an advertising agency variable), yet the performance within the top two groups combined ("top 10" plus "2nd 10") is an improvement over the predatory model. The "final 5" category for the Peltzman constrained model (0% captured) is also a sharp improvement over the predatory model. Finally, the constrained model's prediction rate, 75.5%, is in fact higher than that of the unconstrained model, while the "top 25" summary statistic did not change between the two Peltzman models.

In sum, in case study #2, the lack of statistical significance of the predatory model's variables, combined with the significance of several of the Peltzman variables, again leads to the conclusion that the Peltzman model is to be preferred to the predatory model. In addition the
explanatory power of the predatory model (as seen in the prediction rate measure) is no better than that of the naive model, while the Peltzman model(s) are able to predict 15-20% more of the states correctly.
Footnotes for Chapter III

1 Here the X variable, as presented in Chapter I (p. 25), has been partitioned into two groups.


3 The more general form \( C = F(X) \) is used in this section for simplicity.

4 Rubinfeld, P. 234-241.

5 Another transformation using the cumulative logistic probability function generates a LOGIT model which has similar properties.


7 Shepard's list (source unknown) matches the A.D.A. source for each of the 45 states he examined. As the A.D.A. publication lists 16 reciprocity states though (Shepard claimed 15) apparently the two disagree on one of the five remaining states which Shepard left out. As it is impossible to discern which state differed, one additional test was run deleting all five states. The results did not differ from those reported here, which use the A.D.A. source.

8 Some data (% MOBILE) were unavailable for California and Alabama and therefore these two states were deleted.


12 Compulsory education began in 1918 nationally. Therefore anyone above the age of 52 had the opportunity to (legally) choose to
avoid public education.

13 The correlation between %UNED and % illiterate is $r = .926$. Hence the use of the present (%UNED) measure seems reasonable.

14 The Smith variable, per capita size of the legislature, was also tested. This hypothesis was even less substantiated. The appropriate (negative) sign was found for the coefficient but a $t = .05$ resulted. The rest of the model's results remained unchanged.

15 The values of the coefficients $\beta_1$ and $\beta_2$ are reasonable in comparison with those values found in the previous literature by Stigler, Smith, and Tollison who tested similar variables.

16 Judge et. al., p. 524-25.


19 Thus the percentage of predatory capture states should fall as we move from group #1 to group #5.

20 The technique used to calculate $r$ is described in many introductory statistics texts. See, for example, J. Welkowitz, R. Ewen, and J. Cohen, Introductory Statistics for the Behavioral Sciences, New York: Academic Press, 1971, p. 175-78.

21 For five states it was impossible to define the state as capture or non-capture. For example, in Texas, while price advertising is allowed, several conditions must be met for those who wish to do so. Connecticut, Ohio, Arkansas, and N. Dakota are omitted for similar reasons.

22 "Decennial Census Data...", p. 55.


24 For the $X_1$ and $X_2$ variables, the coefficient values in this study are again consistent with previous empirical work by Stigler, Smith, and Tollison.
In states such as Michigan and Pennsylvania, a large portion of the AGENPOP measure may be those working for one (auto manufacturing) account.

The Peltzman #2 model, with INTER, was designed solely to demonstrate the expected weakness of the AGENPOP variable. It is therefore inappropriate to use #2 to measure the predictive power of "Peltzman's" model. In any event, the results of #2 (not shown here) are similar to the Peltzman #1 results.

Once again, though, the null hypothesis that the two rankings are independent is rejected (here at the .05 level of significance). This is further evidence of the weakness of this measure since in this study, fully 20 of the 45 states as ranked by the Peltzman model were at least 10 (and in 1 case 38) positions higher or lower than the rank given by the Predatory model.
CHAPTER IV
A.) Summary and Conclusions of the Present Study

This study has dealt with a number of dimensions concerning the theory of regulatory capture. It has presented a summary of previous literature, first demonstrating the similarities and differences of the various works presented over the past two decades, and then classifying these works into one of three categories: 1) capture hypothesis, 2) predatory capture, or 3) Peltzman capture.

Of much greater importance, this work provides an empirically testable model of the Peltzman capture theory. Several features of this model are of particular importance. First, the model is general in that it can be applied to several case studies. In each of the two cases examined, the sensitivity of the legislator to the demands and influences of the interest groups have been measured using the same variables. These variables (voting strength, % UNED, VPR, etc.) can be used in a variety of other studies as well.

Second, the variables used directly measure the strength of the different interest groups by measuring their political power, rather than simply measuring the strength of their interest in an issue. This is an advantage over previous studies (i.e. Oster) since interest by a group in an issue is a necessary condition for legislative action, but not a sufficient condition. As well as showing an interest in a particular piece of legislation, the group must also demonstrate
that it is able to affect the likelihood of election of the legislator.

Third, the model developed is general in that it encompasses the simpler predatory model and thus can be (and has been) used in a direct comparison with that simpler model. This third feature is largely a result of the fact that the Peltzman theory is a general theory, but the specific applied model presented allows for the comparison with the predatory model to be made.

The results of the empirical work in Chapter III above support several conclusions. First, the evidence from both case studies supports the Peltzman theory of regulation. Nearly all of the variables tested in the two cases supported the hypotheses arising from the theory, and many of the variables tested were statistically significant. Second, the evidence supports the conclusion that the Peltzman theory is preferred to that of the simpler predatory theory of regulatory capture. Although the rankings of the two models could not be shown as being independent, the evidence in the two case studies has demonstrated that the Peltzman model's rankings are more accurate, resulting in more accurate explanations of the existing state of regulation.

A third conclusion which can be drawn is that in these two cases (and especially the dentistry case) the public's interest can be, and is maintained in many states. This conclusion is contrary to the beliefs maintained by the
predatory capture proponents. Moreover, the Peltzman theory now presents an explanation as to why the public interest is in some cases protected, even when it is in direct conflict with the interests of an industry or professional group. What the evidence suggests is that it is not necessarily the benevolence of the legislator which yields this result. To the contrary, it is the self-interests of the legislator (i.e. political support maximization), and the incentive to protect those self-interests, which leads to this result—in particular, when the public's awareness and voting participation are high.

B.) Areas for Future Research

The dissertation suggests a number of interesting questions for additional research. First, as mentioned in Chapter III, a closer study of the interaction of the legislator and the interest groups, in particular with respect to information dissemination, may further clarify the process of regulatory capture. Specific questions of interest concern 1) the use of the media, either by an interest group or a legislator trying to influence a group, and 2) the influence of this information flow, both on voting groups and legislators.

Second, the question of the effect of non-vote support (campaign aid) is a potential topic for further study.
in the future. Until recently the level of campaign contributions by an interest group was private information. Given the new campaign contribution disclosure laws, future studies of regulatory capture occurring in the 1980's will be able to investigate the effect of campaign dollar support by a group on the likelihood of capture.

Finally, the focus of this and other work pertaining to regulatory capture has been one of explaining why or when capture occurs. Yet, recently there has been a movement toward deregulation. Although most noticeable at the federal level, this activity has also occurred in numerous industries/professions at the state level as well. A logical follow-up question to that of why capture occurs is that of why capture dissolves in different states and at different times. One might expect to find that the same variables (or a subset thereof) as those presented in the present studies again play an important role. On the other hand, additional and/or different variables may be important in these cases.

Clearly, substantial additional research is needed to resolve these and other questions. The initial empirical evidence generated here supports the most recent theory of regulatory capture, and suggests that the theory is substantially correct. Further evidence which demonstrates that the theory holds in numerous alternative settings is necessary. The present study offers a model with which this additional research can be undertaken.


———, County Business Patterns, 1970.


———, Public Health Service, National Health Institute, Compilation of State Dentist Manpower Reports, 1970.
